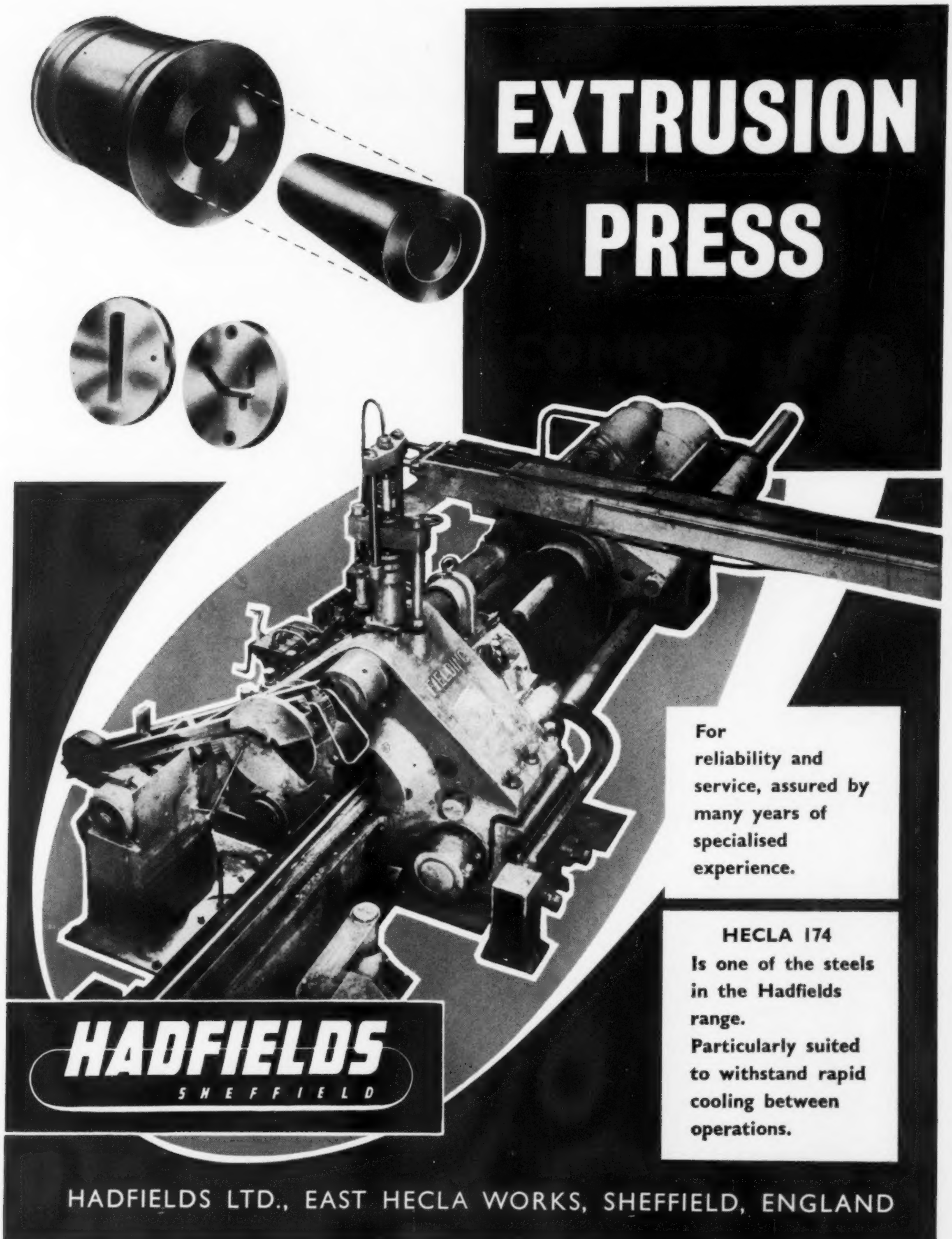
8 SEPTEMBER 1961

METAL INDUSTRY

THE JOURNAL OF NON-FERROUS METALS

VOL 99 No 10 ONE SHILLING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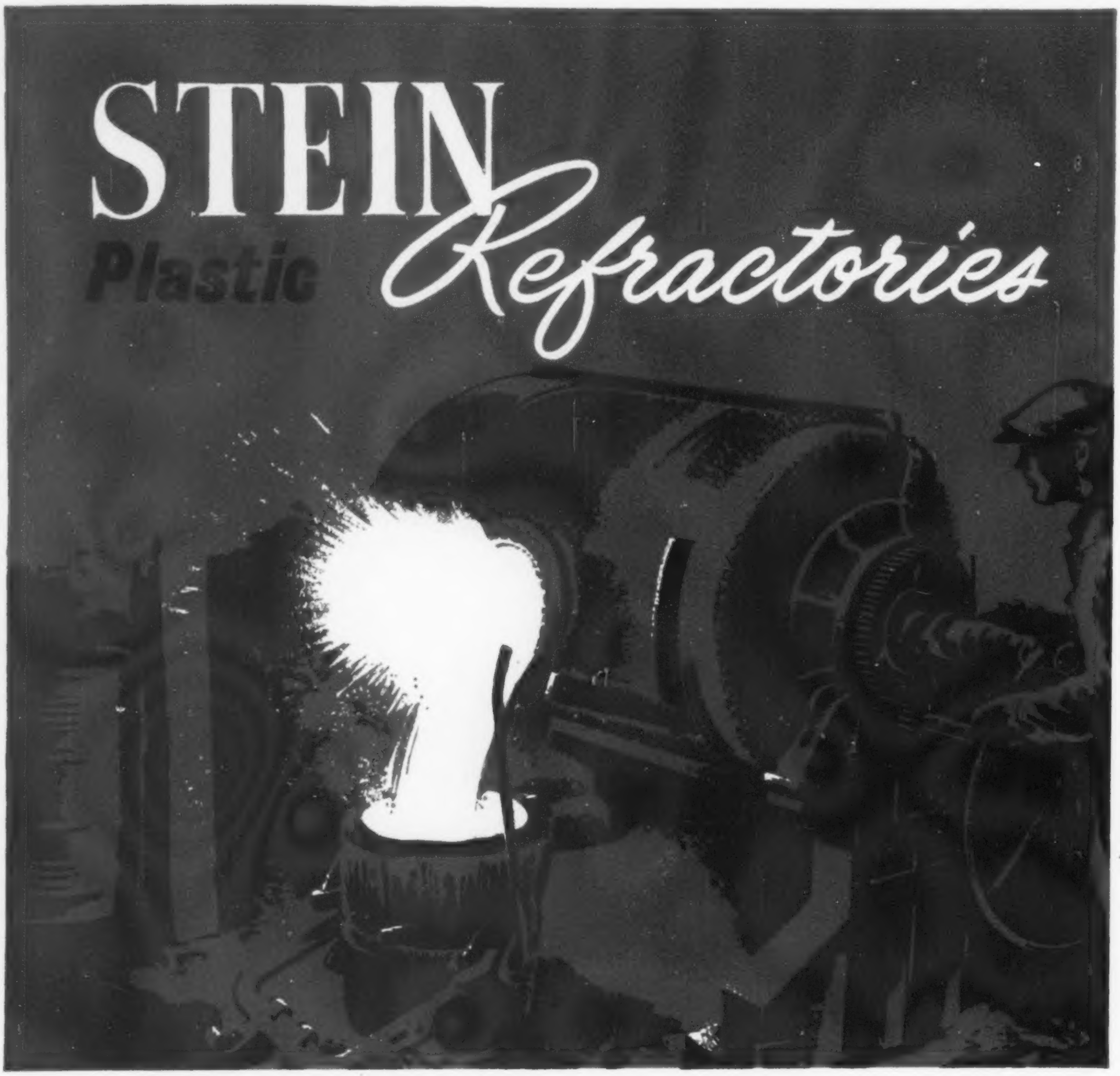

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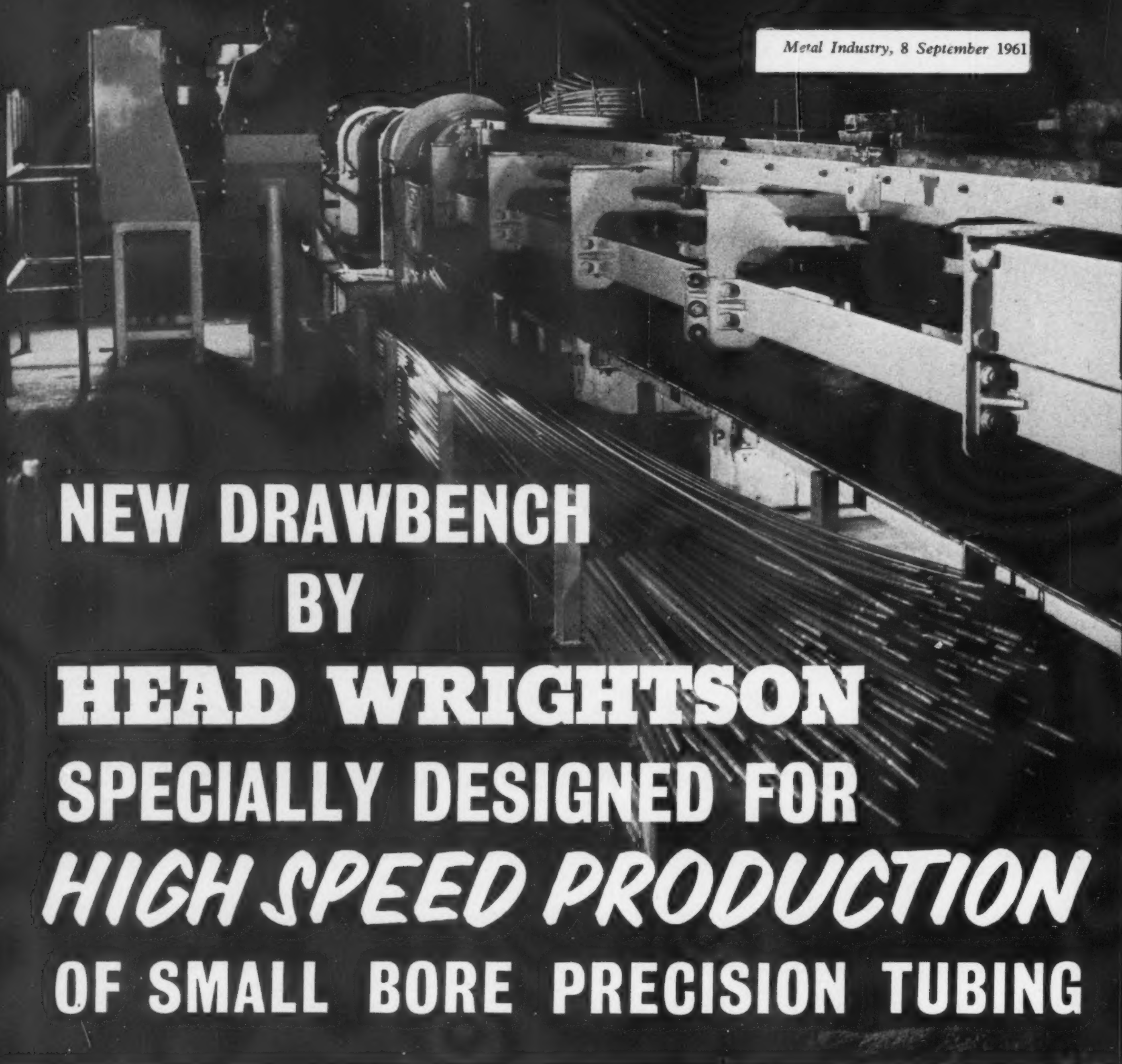

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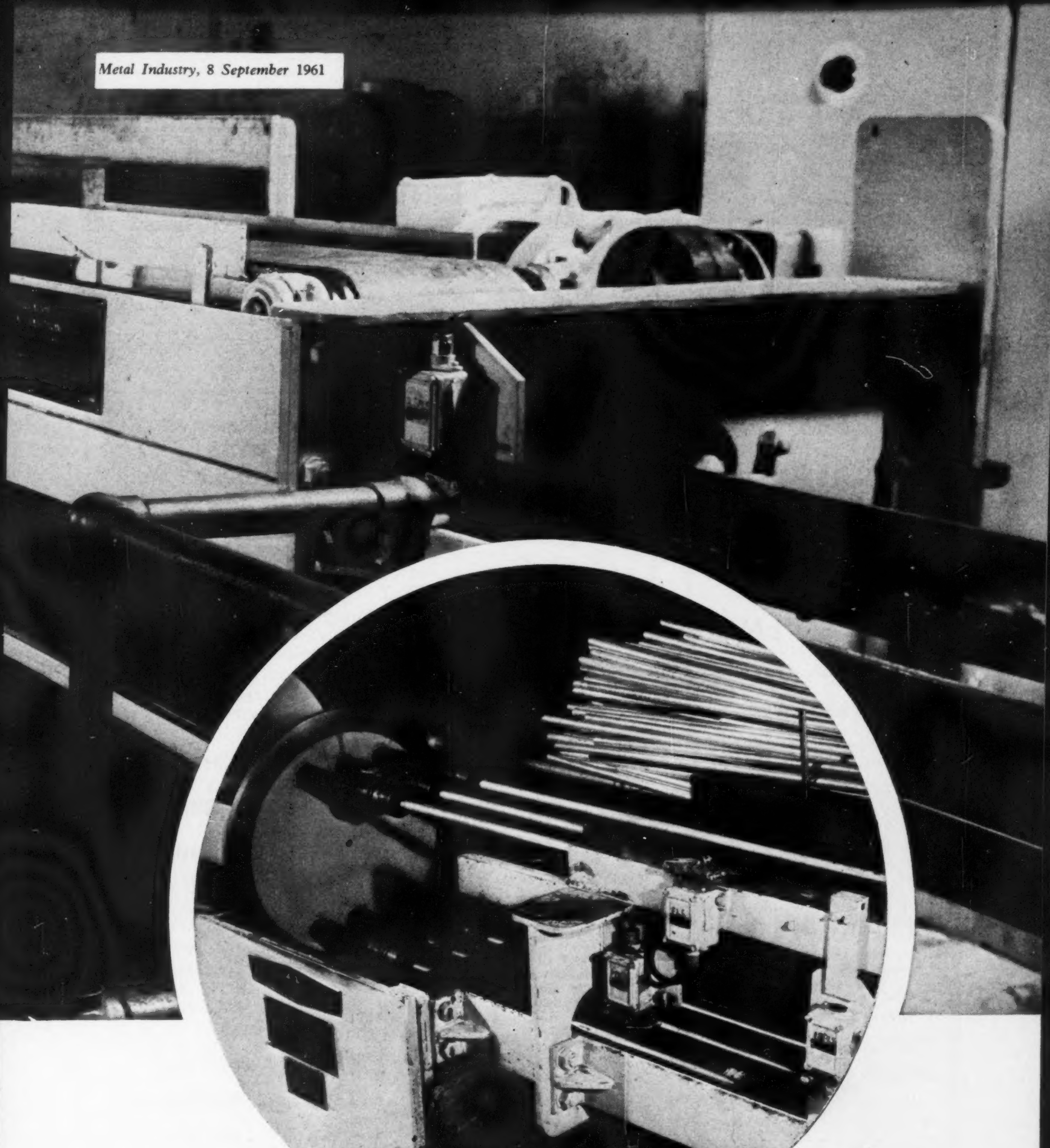

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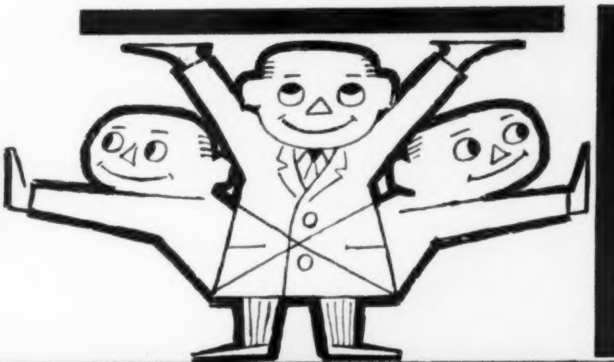

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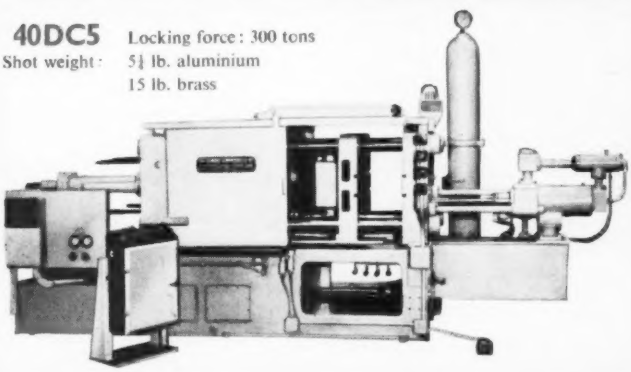

50DC10 Locking force: 500 tons
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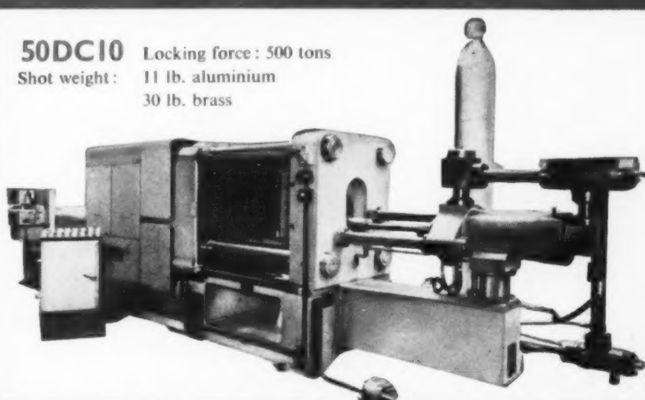
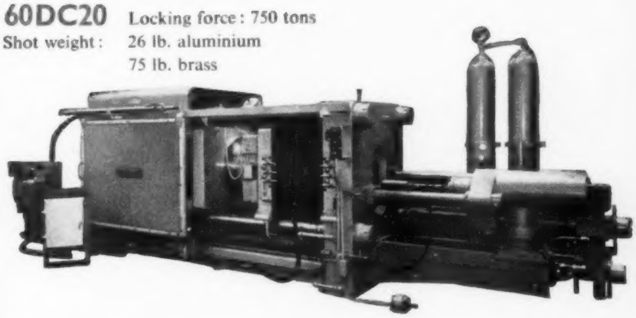
30 lb. brass



60DC20 Locking force: 750 tons
Shot weight: 26 lb. aluminium
75 lb. brass



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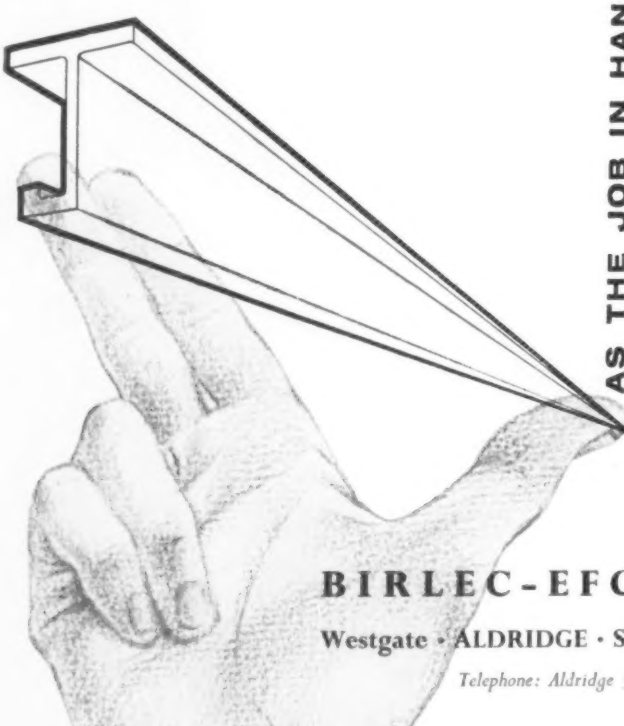

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METAL INDUSTRY

FOUNDED 1909

8 September 1961 Volume 99 Number 10

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PUBLISHED EVERY FRIDAY BY ILIFFE PRODUCTION PUBLICATIONS LTD.
Editorial Offices: 9 Charlotte Street, Birmingham 3. Telephone: Central 3206

Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1.
Tel.: Waterloo 3333. 'Grams: "Metustry, London-S.E.1"

Branch Offices: MANCHESTER : 260 DEANSGATE, 3; telephone, Blackfriars 4412 and Deansgate 3595 BIRMINGHAM : KING EDWARD HOUSE, NEW STREET, 2; telephone, Midland 7191. COVENTRY: 8-10 CORPORATION STREET; telephone, Coventry 25210. GLASGOW: 62 BUCHANAN STREET C.1 telephone, Central 1265/6

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METAL INDUSTRY

8 SEPTEMBER 1961

VOLUME 99

NUMBER 10

Selling Metal

TO-DAY'S competitive markets constitute a definite challenge to those whose job it is to sell primary metal output; an equal challenge faces those selling metal products. There are a number of ways in which the challenge can be taken up. One of the most successful is by the application of market research techniques; first to find out the possibilities of existing markets and secondly to develop new ones. The nickel industry furnishes an example of what can be done.

In 1957 International Nickel found themselves with a free supply of metal for the first time since before the war. Not only were supplies available but, in fact, the capacity to produce nickel was far greater than existing markets could reasonably be expected to absorb. In other words, markets had to be developed for the increased capacity. Increased use of stainless steel was one obvious choice. The situation was complicated by two facts, however. First, to sell seven pounds of metal a market for one hundred pounds of stainless steel must be developed. Secondly, much stainless steel is not marketed direct from the steel mills to manufacturers but through warehouses. For these reasons it was necessary to undertake a precise breakdown of industries so that it could be determined where the markets for stainless steel are and where they might be in the future. Inco then worked with the producers of stainless steel in developing new and larger markets for the metal, even to the extent of organizing retail selling campaigns in co-operation with warehouses and stores.

Aluminium, too, offers an example of efficient marketing. In the United States, the greatest development in capacity had been in extrusion. A number of extruders have proprietary products which utilize a part of their capacity, the balance going on the open market. As a consequence, the market is very competitive. Faced with this situation, one company decided to explore the aluminium extrusion market for a new product opportunity that could utilize part of their extrusion capacity. This was found in the rigid conduit market in which aluminium had been used for many years but in limited quantity because it was not competitively priced with steel. By investing in automatic manufacturing processes the company has been able to compete successfully with steel. In fact, 20 per cent of the steel market has been converted and the rate of conversion is continuing.

Admittedly, the two metals cited above have two advantages, both are comparatively new—and, therefore, have always been forced to develop markets—and both have stable prices. Nevertheless, what they have done other non-ferrous metals can, and must, do. In this connection it may be noted that copper is now endeavouring to break into the market for grey cast iron. As an addition agent to the iron it offers improved physical characteristics at a price more than competitive with rival materials.

Aluminium Alloy L65

EXTRUSION CHARACTERISTICS

EXPERIMENTAL work was undertaken to investigate the effect of various pre-heat homogenization treatments on the mechanical properties of aluminium alloy B.S. L 65 in the extruded and fully heat-treated condition. This alloy exhibits the "press effect" and thus offers enhanced mechanical properties in the longitudinal direction of extrusions compared to other wrought forms.

The sequence of operations involved in the fabrication of this high strength alloy is shown in the block flow diagram (Fig. 1).

The cast structure of the C.C.P. billet contains coarse intermetallics and some low melting point eutectics arising from the coring in solidification. The aim of the pre-heat treatment is not only to attain the plasticity required for extrusion but to dissolve the coarse constituents and reduce segregation by solid diffusion, so as to increase the amount of alloy constituent available for solution during the heat-treatment at 505°C.

The experimental work was planned to vary the structure of the alloy in two ways:

(1) Applying prolonged homogenization treatments at the normal pre-heat temperature of 460°C. and comparing the properties of extrusions produced with no soaking time, with those soaked for prolonged periods.

(2) Pre-heating at temperatures above the lowest melting point eutectics in the cored alloy to study the effects of micro-liquation. For this aspect of the work, thermal analysis had to be carried out to establish the temperature of the lowest melting phases.

Experimental Work

An $8\frac{3}{4}$ in. diameter billet cast by the direct chill process was purchased to provide small billets for the experimental programme. Fig. 2 shows the microstructure in the outer annulus of the billet, the per cent chemical composition being: iron 0·46, copper 4·4, magnesium 0·43, silicon 0·84, manganese 0·78.

Thermal analysis revealed an arrest point at 509°C. in the heating curve of the alloy.

Miniature billets, 4 in. long and $1\frac{1}{2}$ in. diameter, were prepared from the outer annulus of the material so as to avoid variations in structure and composition due to inverse segregation.

The billets were extruded to 0·25 in. diameter rod in a direct extrusion press adapted from a cube crushing machine —Fig. 3. This reduction in area gave an extrusion ratio of 1 : 36.

The extrusion temperature was standardized at 400°C. and was attained by heating the billet in the press container. The extrusion speed was kept constant at 1 ft/min. The homogenized billets were separately pre-heated and then reheated to 400°C. in the press. Three batches of material were obtained with varying pre-heat histories, viz.: (1) no pre-heat soak — no homogenizing by diffusion; (2) pre-heat homogenization for 30 hr. at 460°C. — homogenizing; (3) pre-heat at 530°C. for 30 hr.— homogenizing and liquation.

The unetched and etched structures obtained by homogenization at 530°C. are shown in Figs. 4 and 5. Some streaks and rosettes of liquated phases may be seen in the unetched structure.

All three lots of bars were then solution heat-treated, quenched and aged under identical conditions. The results of mechanical tests and metallographic examination are shown in Table I.

Fatigue testing, with smooth Rolls-Royce type test pieces in a rotating cantilever machine, was also carried out. Fig. 7 shows the S/N curve for the material, exhibiting a completely fibrous structure, which had not been homogenized.

Comparative fatigue tests between this fibrous material and the recrystallized structures of the homogenized extrusions were then carried out. The results showed no significant difference (at the 0·05 per cent confidence level) between the fatigue lives of the three

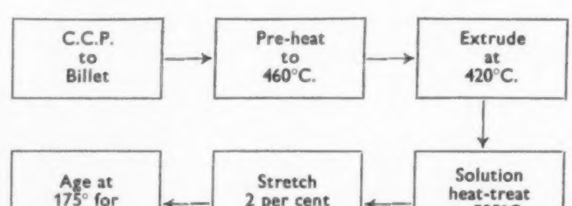


Fig. 1—Sequence of operations involved in fabrication of B.S. L65

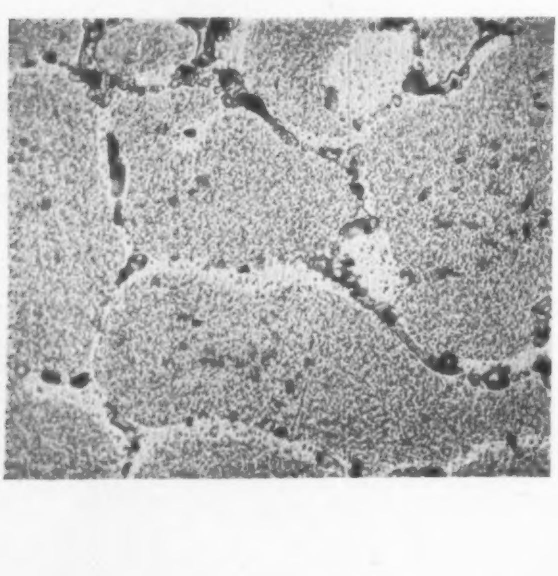


Fig. 2—Microstructure of outer annulus of billet. Etched in Wassermans' reagent. ×660

By

T. R. G. Williams M.Sc., A.I.M., **S. W. Hallwood, R. W. Hayden**

AND MECHANICAL PROPERTIES

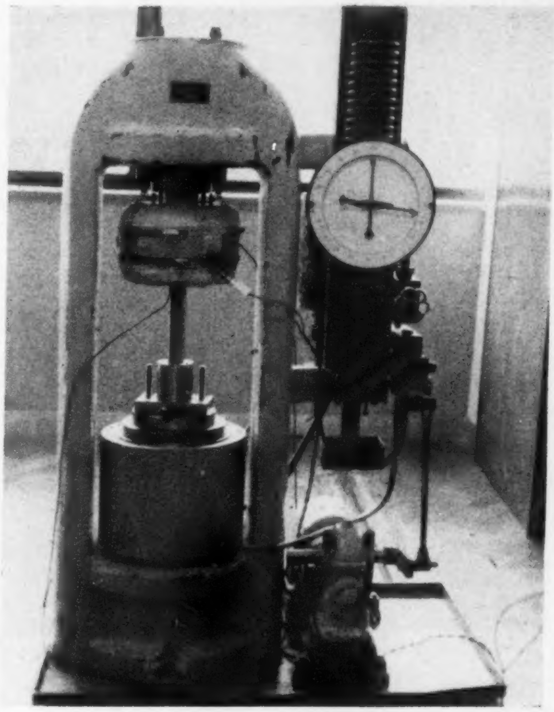


Fig. 3—Experimental direct extrusion press

populations at stress levels of 14 and 19 tons/in^2 respectively.

The fatigue fractures obtained were classified according to the type of crack propagation path. Fig. 8 shows a longitudinal section through the fatigue fracture obtained in the fibrous grained extrusion.

Discussion of Results

At the extrusion ratio of 1:36 only the rod produced from the billet which was not homogenized preserved the extrusion fibre texture. A pre-heat soaking treatment both above and below the liquation temperature has, therefore, caused recrystallization to fine grain during solution heat-treatment and prevented a study of the effect of soaking times on the mechanical strength of fibrous grain as planned in the experiment.

Incomplete solution of the alloy component in the fibrous grain, due to the absence of soaking treatment, and the fine grain size of the recrystallized material have combined to reduce the "extrusion effect" to about 1 ton/in^2 in tensile strength (Smith[1] reports a difference of approximately 3 tons/in^2 between fibrous and recrystallized coarse grain material after homogenizing treatment).

Micro-liquation and a high temperature soaking treatment have had no significant effect on the tensile and fatigue strength of the recrystallized material.

The S/N curve of the fibrous material shows an increase in scatter of results with increasing fatigue life and a discontinuity at a stress level between 21 and 22 tons/in^2. There is a change in the fracture appearance at this stress level, from a crescent-shaped fatigue crack propagation path below, to a concentric crack path above the discontinuity. Two recent publications have reported discontinuities in the fatigue curves of metals. Levy and Porter[2] have revealed a discontinuity in the S/N curve of copper and a review of Russian work[3] has shown a discontinuity in Duralumin at 21·5 tons/in^2.

No significant difference in the fatigue strength of the fibrous and recrystallized material was apparent in

Fig. 4—Microstructure of unetched homogenized billet showing rosette of liquated material. $\times 660$

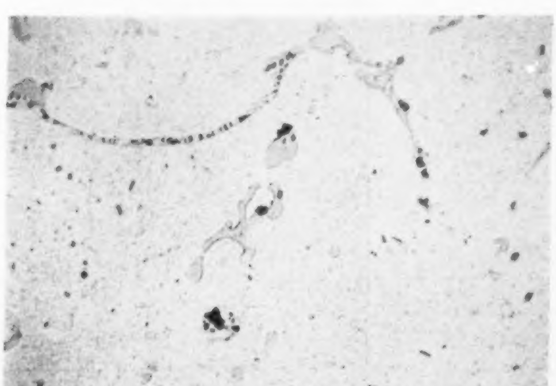
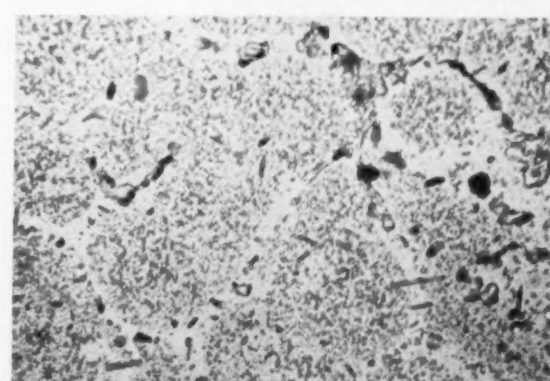
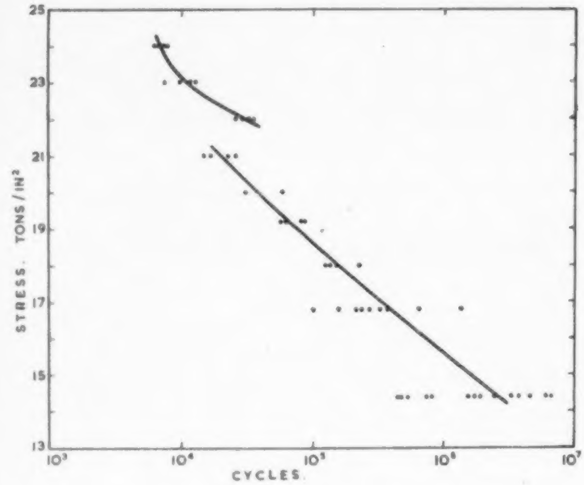


Fig. 5—Microstructure of homogenized billet. Etched in Wassermans' reagent. $\times 660$





Left: Fig. 6—Microstructure of bar homogenized at 460C° for 30 hr. Etched in dilute hydrofluoric acid. ×12

Above: Fig. 7—S/N curve for unhomogenized bar

the tests. The highly preferred orientation of the extrusion fibre with its elongated grain structure has offered no benefits in fatigue strength.

Under normal conditions, in the direct extrusion process L 65 alloy reveals a duplex structure after heat-treatment with a fibrous core and a coarse grained outer band (see Fig. 9). Grainger and Willis[4] have enumerated the disadvantages of this outer band: (i) it causes about a 10 per cent loss in fatigue strength; (ii) causes chatter between tool and workpiece during machining; (iii) the coarse grain becomes visible on the machined surface giving visual effects which are objectionable for many purposes; (iv) liability to grain boundary cracking during quenching; (v) orange peel effect during stretch forming and straightening. The difficulties of straightening are also increased due to lower proof strength of the outer band; (vi) adverse effects during forging—(a) surface roughening in open die forging, (b) fissures and cracks in closed die forging.

Whenever possible, the coarse grained outer band is scalped off and its depth is carefully regulated by specification. With thin sections ($<\frac{3}{8}$ in. thick) this is impracticable and the lower fatigue strength has to be accepted.

Methods of preventing the formation of the outer band without losing the "extrusion effect" are of three kinds: (i) to reduce the strain effects below that of the critical value of recrystallization to coarse grain; (ii) extruding at the solution heat-treatment temperature and quenching at the die, so that the metal is held at temperature for only a short time after straining, and recrystallization does not have time to occur; (iii) developing an alloy whose critical level of work is beyond that occurring in normal extrusion.

The first remedy involves overcoming the frictional drag between the billet and container in the direct extrusion process. Locke[5] has reviewed this problem; some of the lubricants which have been tried include Dag, glass and soft alloys. The inverted extrusion process circumvents this problem but introduced difficulties of design and of operation, such as inferior extrusion surfaces and lack of immediate visual control.

Fig. 8—Longitudinal section through fatigue fracture in fibrous grained extrusion. Etched in 25 per cent nitric acid at 70°C. ×12

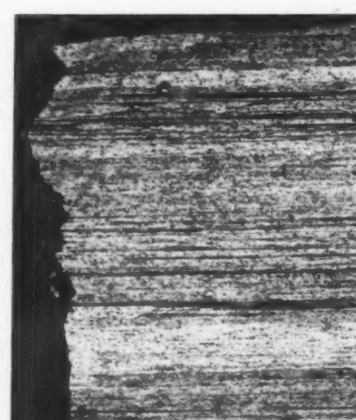


TABLE I—TEST BAR RESULTS

Pre-heat Soak Time and Temp.	Average (3 results) Mechanical Properties			Microstructure
	0·1 per cent Proof Stress tons/in²	U.T.S. tons/in²	Elongation per cent	
No soak	28·2	32·1	6	Fibrous with shallow outer-band
30 hr. at 460°C.	26·1	31·2	4	Completely recrystallized to fine grain—see Fig. 6
30 hr. at 530°C.	26·1	30·9	4	Completely recrystallized to fine grain

Fig. 9—Duplex structure after normal heat-treatment. Etched in 25 per cent nitric acid at 70°C. ×26

The second remedy is applied extensively to the aluminium-magnesium-silicon alloys but control of temperature of the aluminium-copper-magnesium-silicon alloys is considered too critical.

The third remedy has recently been studied by French investigators,[6] and they claim that extrusions free from coarse grain can be obtained in high strength aluminium alloys containing zirconium. Grainger and Willis,[4], however, state that the recrystallization characteristics of the alloy are so radically altered by zirconium that its fabrication and other properties may be seriously affected, and they recommend that a more critical study be made before the alloy is offered with confidence to the aircraft industry.

The experimental work reported here indicates that a fine grained recrystallized structure can be obtained in extrusions of L 65 alloy, whose fatigue strength is not significantly different from that of fibrous grain exhibiting the "extrusion effect". If these fine grain structures could be attained in large scale extrusions the problem of the coarse grained outer band would be circumvented. Two possible approaches to the problem present themselves: (i) lowering of the manganese content of the alloy to facilitate recrystallization; (ii) increase the amount of deformation in extrusion by lowering the extrusion ratio.

Dreyer and Seemann[7] have shown the importance of manganese in preserving the extrusion effect of the Duralumin-type alloys. Care must be exercised in lowering the manganese content below 0·5 per cent, however, as the recent work of Ghate and West[8] has shown that a reduction in elongation can occur.

Decreasing extrusion ratios would entail higher extrusion pressures but although this effect could be offset by using higher extrusion temperatures, it would probably be at the expense of reducing extrusion speeds. The benefits accruing from avoiding scalping of the final extrusion would more than offset this difficulty. This technique would be particularly attractive for round bars, which are very prone to quench cracking, and to hexagonal bars in which the core is often removed to fabricate nuts.

Conclusions

A pre-heat homogenizing treatment increases the tendency of this alloy to recrystallize during solution heat-treatment.

The S/N fatigue curve of the fibrous material, extruded without homogenization treatments, reveals a discontinuity between stress levels of 21 and 22 tons/in^2. There is a significant change in the appearance of the fatigue fractures at this discontinuity.

There is no significant difference between the fatigue strength of the fibrous and fine grained recrystallized material.

Overheating during the pre-heat homogenization treatment has produced no adverse effects on the mechanical strength of the alloy.

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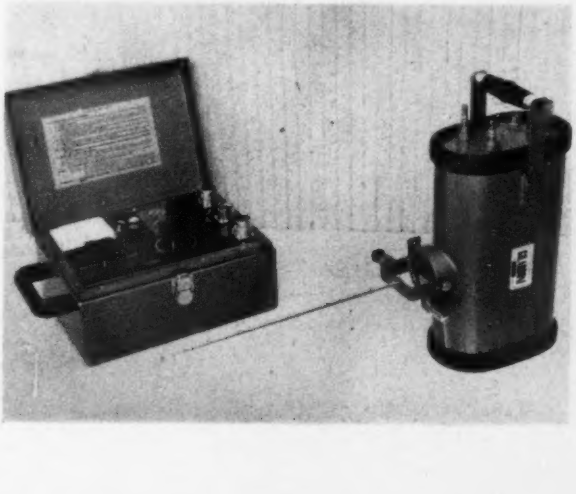
8 V. B. Ghate and D. R. F. West; *Metallurgia*, **63,** 269.

X-Ray Flaw Detection

RECENTLY introduced to this country by Manchester Oil Refinery (Sales) Ltd., the ultra-lightweight Gilardoni Minispot X-ray flaw detection unit, consisting of a tubehead and a control box, is able to detect flaws in 4 in. thick aluminium or 1 in. thick steel.

The weight of the tubehead is 43 lb. and its dimensions are 16 in. by 8¾ in. by 6½ in. The focal spot size is 1 mm. by 1 mm. Cooling is by circulating water or immersion, the tubehead being of watertight construction. Maximum power demand is 700 VA.

The control box weighs 25½ lb. and measures 14¾ in. by 9¼ in. by 6¼ in. Provision is made for footswitch or time control, and it is usable on 220 line voltages.



Minispot X-Ray flaw detection unit

Bright Annealing Copper Wire and Strip

IN their factory at Forge Lane, Manchester, the first installation, made 26 years ago, by Richard Johnson and Nephew Ltd. for bright annealing copper wire and strip was a single Efco furnace which could be moved to any one of three bases where the charge was sealed under a heat-resisting steel hood and protected with an exothermic atmosphere produced from town's gas.

Now a building has been erected to house a new installation in a modern layout planned to provide the utmost convenience, not only for the handling of charges and the operation of the furnaces, but also for the transfer of work into and out of the department. The centre of the building is used for the handling of charges and, on both sides of this central handling position, provision is made for two parallel production lines, each consisting of two furnaces and eight bases. Three of these production lines are in operation, and foundations have been laid for the fourth line to complete an 8 bell 32 base installation, each base capable of accepting a two-ton charge. The protective atmosphere is supplied by five Efco exothermic generators, each having a capacity of 2,000 ft^3/hr., mounted on an overhead platform along one side of the new shop. The atmosphere is delivered to a ring main feeding the individual bases. When the installation is complete, not more than four generators will need to be used simultaneously.

Right—A charge of copper strip in coils

Below—Two production lines for bright annealing copper wire and strip at the works of Richard Johnson & Nephew Ltd. Each line comprises two Efco bell furnaces and eight bases complete with work stands, baffles and hoods

The furnaces operate at temperatures up to 550°C. and are rated at 120 kW. They are heated by elements of nickel-chromium strip arranged in sinuous form and supported around the chamber walls. The temperature of each furnace is controlled automatically with an indicating and recording instrument housed with contactors, fuses and pilot lights in separate floor-standing cubicles.

The furnace bases take a charge 54 in. high, in a baffle having a diameter of 39 in. The work is placed on a charge stand supported from the hearth, and beneath the stand is an atmosphere recirculating fan of patented design. The charge in its baffle is covered with a hood which makes a gas-tight seal with the furnace base. The baffle shields the charge from direct heat radiation from the hood and directs the flow of atmosphere in a definite path around and through the charge. The hoods and baffles are made of aluminized steel.

The furnaces are accurately positioned over the bases by engagement with locating posts. Electrical connections are made automatically as the furnaces are lowered over a charge, with an audible indication should an atmosphere recirculating fan fail to operate. Provision exists for water spraying the hoods to speed the cooling of charges.

The complete installation was supplied by Efco Furnaces Ltd.

Die-Cast Magnesium Saw

EQUIPMENT AND METHODS EMPLOYED IN PRODUCTION OF LIGHTWEIGHT CHAIN SAW COMPONENTS

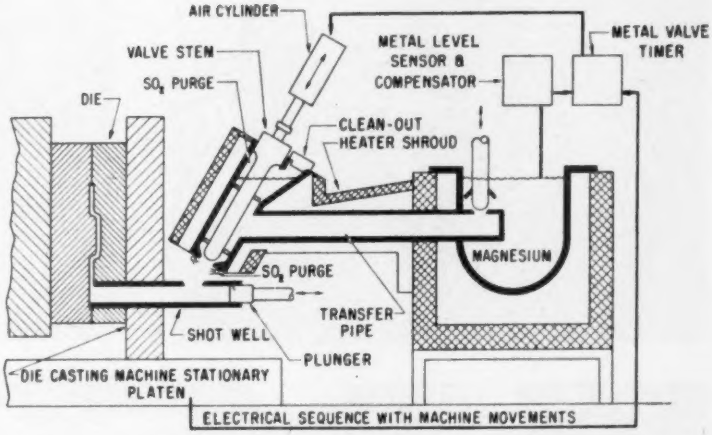


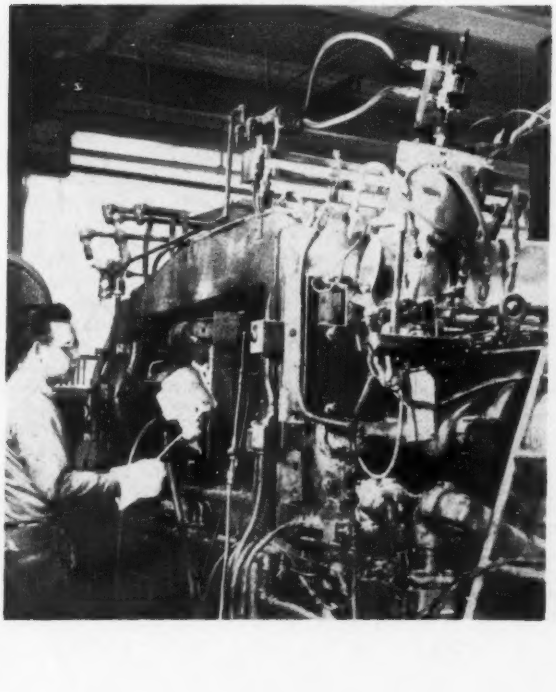
Diagram showing arrangement of the metering unit feeding metal to the die-casting machine

MANUFACTURING a wide range of outboard motors, power lawn mowers, roto tillers, snow blowers and chain saws, the Outboard Marine Corporation of Canada Ltd., in Peterborough, Ontario, has recently changed over to magnesium for the production of pressure die-castings in the range of chain saws. There are 12 separate die-castings in magnesium, ranging from a 32 oz. frame to 0·8 oz. After a careful study and discussions with a number of people in the magnesium industry, the company elected to install automatic metering die-casting units and electrically operated melting and holding pots for the magnesium operation.

Initially, a 1,240 lb. 450 kW coreless induction melting furnace was installed and this furnace gives an hourly throughput of 550 lb. of metal. To augment this melting furnace, a gas-fired melter of 100 lb. capacity is used. This unit has a throughput of two 300 lb. melts per hour. Refining of the metal is carried out in the melting pots.

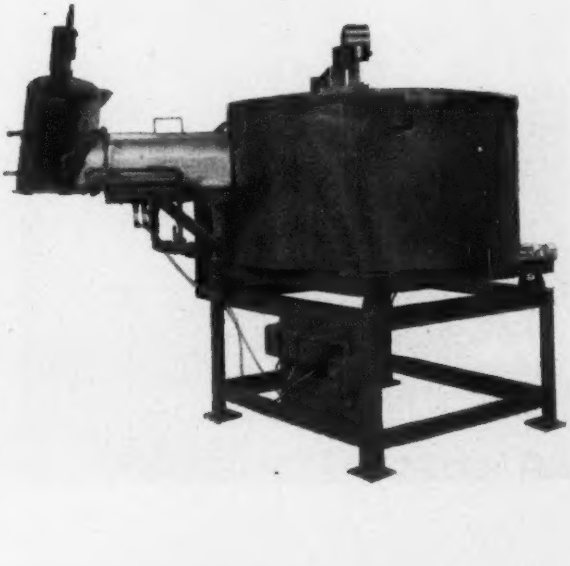
Three 600 ton capacity die-casting machines (Fig. 1) are used for magnesium casting and two of these are set up with Kemp metering units which automatically put the correct amount of metal in the shot well. Fig. 2 shows the metering unit before being attached to the die-casting machine. The 31·5 kW holding pot of each metering unit is electrically resistance heated; however, the tube taking the metal to the metering valve (see diagram) is heated by gas burners. These pots have a capacity of 1,200 lb. each with a usable capacity between refilling of 250 lb. The third die-casting machine used for magnesium has a 600 lb. gas-fired holding pot from which the operator hand ladles the metal to the shot well. A flux baffle is used on this pot with SO_2.

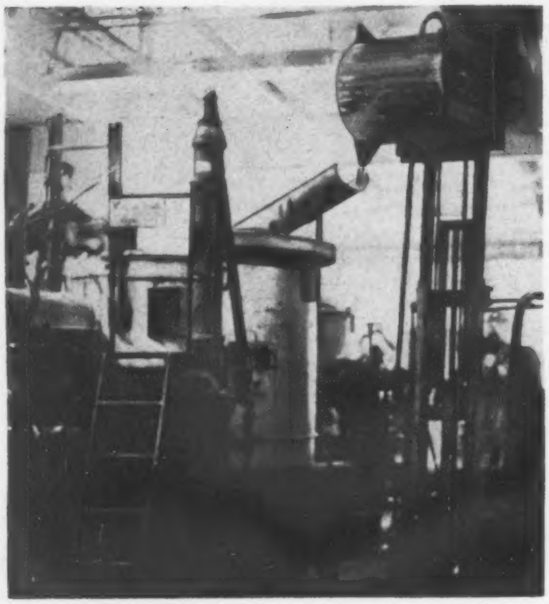
The arrangement of the metering unit is shown in the diagram. The air-operated stainless steel, Stellite-faced stop-valve meters the flow of metal gravity fed from the holding pot.



Left: Fig. 1—One of the 600 ton die-casting machines

Below: Fig. 2—Kemp metering unit before installation alongside the die-casting machine





Above left: Fig. 3—Fork-lift truck transferring metal to the holding pot

Above: Fig. 4—Trimming press operation

Above: Fig. 5—Machining is carried out on automatic machines

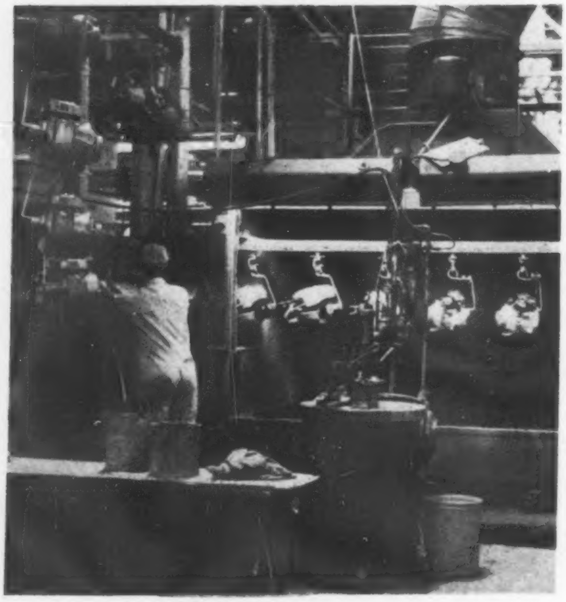


Fig. 6—Components passing through spray booth

The period of opening of the valve determines the quantity of metal that is allowed to go into the shot well of the die-casting machine. As the valve is interconnected to the control circuit of the pressure die-casting machine, the whole set-up is virtually automatic.

Metal is at present being transferred from the melting furnaces to the holding pots by a 190 lb. capacity bull ladle carried on a fork lift truck. Pouring from the bull ladle to the holding furnace is carried out by the lift truck operator (Fig. 3). A programme is under way to study the feasibility of pumping directly from the induction melting furnace to the holding pots of the metering units.

After removal from the die, the castings are inspected visually (Fig. 1) and a potassium rhodizonate test is made in the laboratory for a check on any flux inclusions. Flash and runners are removed on trim dies designed for each part (Fig. 4). Machining is carried out on automatic equipment including multiple gang drills and borematics (Fig. 5). Conveyor assembly is utilized and the assembled units, minus blade and chain, pass through the testing booth, where the engines are started and checked out. The conveyor carries the chain saw through a hand spray booth (Fig. 6) to the packaging, where they are boxed for shipment—ready to go out and do a job of work.

OUT OF THE MELTING POT

Some Welding

ONE of the drawbacks of the classification of processes is the inflexibility which it imposes on any consideration of a possible practical solution to some given task. Given the classification, a solution is likely to be sought in terms of, say, spot welding, flash-butt welding, inert gas arc welding or some other definite process. In the circumstances it is much more di ficult to consider the possibility of producing the desired joint by the application of heat and pressures (call it hot pressure welding, if you must) by some means or other most appropriate to the given situation. This appears to have been done successfully in the case of a novel method of joining two metal tubes. Proceeding from first principles or, what amounts to the same thing, taking a fairly obvious first step towards the desired end, the tubes are first assembled so that the end of one tube overlaps the end of the other tube, for which purpose one of the ends may be expanded or reduced before the tubes are assembled. The assembled tubes are then suitably clamped at points situated away from the lap joint. Welding of the latter is then effected by applying to a surface of the lapped joint a rotational frictional force to bring the contacting surfaces to welding temperature, at the same time effecting some deformation of the tubes to ensure the desired configuration of the finished joint. The rotational frictional force can be applied either by forcing a rapidly rotating hard alloy tool having a cylindrical head with flats and a tapered end into the joint, or by an external die which is rotated about, and advanced over the lapped joint to provide the bonding pressure and heat.

Lubricants

DESPITE the widespread use of lubricants containing particles of a solid material in suspension, the principles of such compositions do not appear to have as yet received adequate consideration on a sufficiently broad basis. The principle of using as lubricants or lubricant additives particles of materials having a layer lattice structure is familiar, and its embodiments have been extensively investigated, both in regard to the materials (of which graphite and molybdenum disulphide are the best known examples), as well as in regard to the preparation and composition of the lubricant mixtures containing them. Much less has been done in regard to the possible principles governing the use of metal particles as lubricants or lubricant additives. Principles requiring investigation in this connection relate to the composition of such particles, to their shape and structure, and to their function as lubricants or lubricant additives. Some of these aspects are brought out in a recent suggestion for a metal powder for use in lubricating compositions. The powder is prepared by melting copper and lead in proportions of from 50-55 per cent copper and 50-45 per cent lead, heating the melt to 980°-1,035°C. and then atomizing it to form particles in which the lead is present in the form of inclusions of less than 0·1 micron in a copper matrix. The atomized particles passing through a screen having 100 mesh per linear inch are ball-milled to a flake powder having a particle size of less than 3 micron. The dried powder should have a thin oxide or hydroxide coating corresponding to a weight loss of beween 0·3 and 1 per cent on heating to a reducing temperature in hydrogen. The powder can be used either dry or in the form of a suspension, e.g. in water containing ethylene glycol or sodium silicate. Quite a different principle is involved in the suggested use of spherical particles of suitable size and composition with a view to their acting as ball bearings between sliding surfaces. For this purpose, conditions would, of course, have to be such as to prevent the embedding of the particles in the sliding surfaces. By contrast, other types of metal or alloy particles might be selected and used under conditions that would cause them to become embedded in the surfaces, thereby modifying the frictional and wear characteristics of the surfaces. Yet again, it should be possible to arrange for suitable metal powder additives which would build up on sliding surfaces to make good dimensional changes caused by wear.

Workable

ALTHOUGH far from perfect, a practicable solution to the difficult problem of melting copper-chromium hardener alloys with chromium contents up to about 10 per cent has recently been described. The difficulty arises from the slow and limited solubility of chromium in copper, which calls for a temperature of 1,600°-1,650°C., at which copper is very aggressive towards refractory materials. Melting in iron-core induction furnaces resulted in considerable losses of chromium. The decision to use a coreless crucible-type induction furnace of 0·9 tons (steel) capacity, a rating of 500 kW and operating at 2,000 V and 1,000 c/sec., brought with it the problem of finding a suitable lining. Rammed refractory linings made with the use of a metal former did not have sufficient time for adequate sintering before the melting of the former, with the result that the lining was rapidly penetrated by the molten alloy, the turns of the inductor becoming short-circuited after the first or second melt. This difficulty was overcome by providing a graphite crucible made by machining from a graphite electrode and measuring 800 - 850 mm. high by 290-350 mm. internal diameter, with a wall thickness of 50 mm. and a base thickness of 70-110 mm. With the graphite crucible acting as a former, the space between it and the inductor coil was filled by ramming with ground magnesite brick or with ground fused alumina (86 per cent Al_2O_3). The alumina proved to be more satisfactory in that it ensured a longer life. Such a furnace could be brought up to temperature, ready for melting, in about 2 hr., the lower turns of the inductor being subsequently disconnected to prevent overheating of the crucible bottom. The life of the furnace ranged from 45 to 25 melts, for 500 kg. melts of copper-chromium alloy with 4 and 11 per cent chromium, respectively. The factors limiting the life included the vigorous oxidation of the graphite leading to a reduction in wall thickness, and by its penetration by the molten alloy (the graphite had an apparent porosity of 23·0-28·3 per cent), the alloy subsequently penetrating through the rammed refractory layer and reaching and short-circuiting the inductor.

Skimmer

Products and Processes

Trends in the Development, Application, Processing, Design and Working of Non-Ferrous Metals and their Products

Disc Calculator for Radiologists

INCORPORATING log factors against film speed, Curies, thickness of material to be X-rayed or gamma-rayed, time, focal distance, etc., on circular discs, each having independent movement, a novel calculator for radiologists has been produced by Blackwell's Metallurgical Works Ltd. The calculator, one of several devised by one of the firm's directors, is being used by radiologists in the engineering and shipbuilding industries.

Controlling Low Oil Flow Rates

AN OIL METER which measures accurately the flow of fuel oil at rates as low as $1\frac{1}{2}$ gal/hr. under heads as low as 2 ft. is available from Walker Crosweller and Co. Ltd. Primarily intended for the measurement of the flow of fuel oil to burners, the meter provides an economic means of recording such information on the smaller industrial applications such as oil-fired boilers, furnaces and ovens.

The instrument, which is of the integrating type, is a specially calibrated version of the company's standard $\frac{1}{2}$ in. Arkon oil meter, which is normally calibrated to read flows down to 4 gal/hr. An inherent feature of the design of this meter is its nutating piston principle—a flat disc oscillating on its periphery—which makes it extremely sensitive. It is said to be accurate to within ± 1 per cent.

Machinable Carbide Dies Cut Production Costs

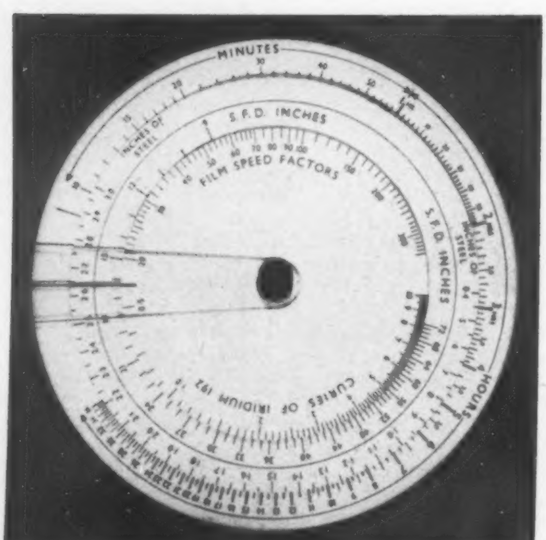
A SINTERED composite of tool steel and titanium carbide, produced by powder metallurgy techniques by Chromalloy Corporation's Sintercast Division (West Nyack, New York), is being used to cut production costs in pressing operations. Dies made of this material give ten times longer life between polishings and may be re-worked many more times. Another advantage is the fact that galling is no longer a problem.

In the annealed state, the steel-bonded carbide, known as "Ferro-Tic C", can be sawn, drilled, turned, reamed, or threaded with ordinary toolroom equipment. It is hardenable to Rockwell C-71 by simple heat-treatment procedures. Dimensional stability is excellent. Dies are machined extremely close to finished size and require only superficial polishing after hardening. Once hardened, the machinable carbide has unusually high wear resistance, without sacrificing impact strength. When no longer needed, obsolete die sections can be annealed, then remachined and rehardened for use in new tooling.

One typical manufacturing operation consists of drawing stainless steel cups made to commercial tolerances in two sizes: $1\frac{1}{4}$ in. o.d. by $2\frac{1}{2}$ in. deep, and $1\frac{1}{8}$ in. o.d. by $2\frac{1}{8}$ in. deep. Cups are formed in dies with Ferro-Tic drawing ring inserts. Punches and other sections of the dies are made of standard high-carbon, high-chromium tool steel. It is also being used for several other tooling applications. Among these are notching dies, as well as a third set of drawing dies for a larger ($1\frac{3}{8}$ in. o.d.) stainless steel cup.

Precision Device Aids Automation

CAPABLE of performing a wide variety of tasks in assembly and related operations, a device known as the TransfeRobot 200 has been made available in this country by U.S. Industries Inc. (Gt. Britain) Ltd. This general-purpose automation machine can be programmed to perform a large variety of operations, including feeding machines,



Left: The disc calculator for radiologists introduced by Blackwells Metallurgical Works Ltd.

Below: Oil meter for measuring flow rates as low as $1\frac{1}{2}$ gall/hr. under heads down to 2 ft.

loading, welding, riveting, oiling, drilling, piercing and bending, merely by changing the accessories. The machine consists of an arm and an actuator which can be fitted with many types of fingers and jaws, all under the control of a self-contained electronic brain. The machine can also control other machines and is thus in constant communication with the rest of the production line.

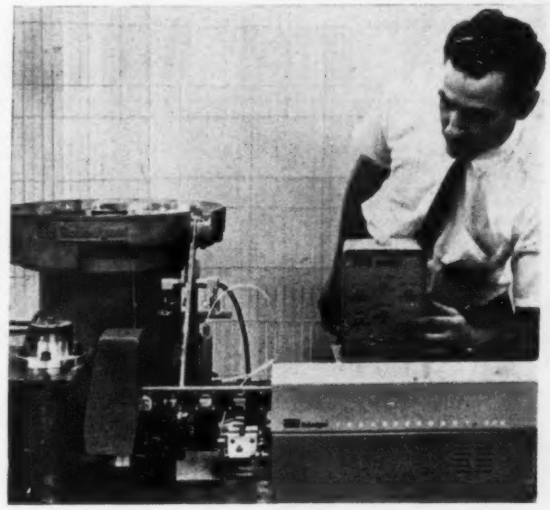
Among current applications are the following: Oiling a complete clock assembly as it passes on a conveyor belt. The machine oils eight precision bearings simultaneously in one second. In a typewriter plant the machine picks up, transfers and places a small component into a close-fitting nest for an automatic machining operation. In the manufacture of an automobile steering assembly, the TransfeRobot feeds partially fabricated parts to a trimming press, orders the press to cut off excess material and ensures that the finished parts are properly discharged from the press.

Single Die-Castings for Two Components

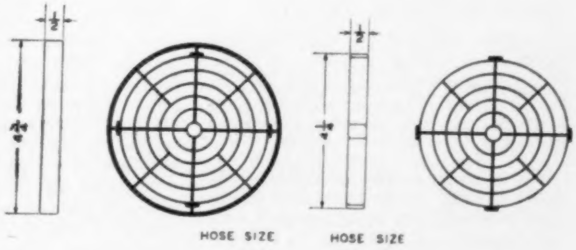
DOUBLE duty from the same casting is one of the features of a die-cast zinc alloy screen used by the Waterous Company of St. Paul, Minnesota, to prevent rocks and other foreign matter from being sucked into its model CMB fire pump. The pump passes 1,250 gal/min. of water, so this screen must be tough and corrosion-resistant, but with extra-thin vanes and smooth surface for unimpeded water flow.

Originally, these screens were laboriously fabricated from sheet brass, with the vanes brazed together. Switching to zinc die-casting not only provides a 33 per cent cost saving, but enables two different size screens to be made from the same casting. The tapered vanes have a minimum wall thickness of $\frac{1}{32}$ in., and zinc alloy is the only die-casting material that can fill these thin sections and still meet the functional requirements.

The only production step needed after giving the screen a zinc chromate finish is slitting the outer ring so that it is possible to bend out a portion, thereby providing a means of friction-fitting the screen in the bore of the intake tube. The ductility of zinc is a great advantage here. The second screen, for intake tubes $\frac{1}{2}$ in. smaller in diameter, is made by cutting off the outer ring and its attaching ribs. The new outer ring is then slit so that the screen can be friction-fit inside the tube.

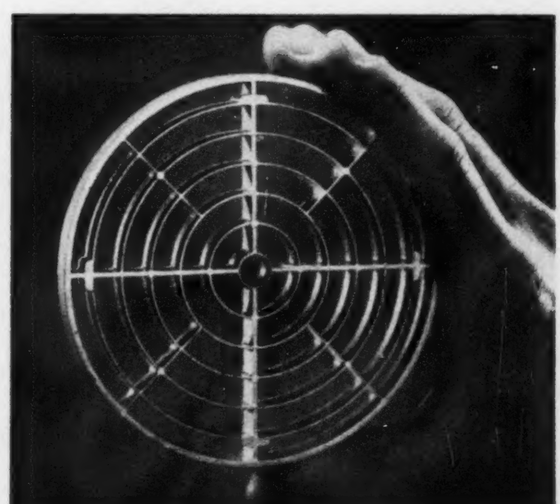


Above: The TransfeRobot 200 with arm extended delivering a watch plate to bear against a carbide cutter tool. The machine is fitted with a vacuum head for this operation



Above: Diagram showing two screens obtainable from a single pressure die-casting by trimming off the outer ring, and, below, the finished casting for the larger screen

Combination die with steel-bonded titanium carbide ring insert for maximum wear resistance. The insert is machined in the annealed state and then hardened to Rockwell C-71



MEN and Metals

Having left the firm of Stevens and Struthers Limited, **Mr. A. J. N. Brown** also retires from the Council of the Association of Bronze and Brass Founders. Mr. Brown was elected to the Council at the formation of the Association in 1942 and has served as a Council member continuously until his retirement. In addition, he served as Vice-President for two years and a term of two years as President.

Previously a director of Quasi-Arc Ltd., **Mr. Robert Butler** has been

appointed managing director of Eutectic Welding Alloys Co. Ltd.

Deputy director of the National Physical Laboratory, **Dr. G. G. Macfarlane** is being appointed director of the Royal Radar Establishment at Malvern and will take up his duties early next year.

For next year, **Sir John Cockcroft,** O.M., F.R.S., has been elected President of the British Association for the Advancement of Science.

The director-general, **Sir Norman Kipping,** and the deputy director (overseas), **Mr. John Whitehorn,** of the Federation of British Industries are visiting Japan from October 4 to October 21. During their stay they will have discussions arranged by the Keidanren—the equivalent in Japan of the F.B.I.—and will visit a number of Japanese factories.

In consequence of a re-organization of area representation by Wild-Barfield Electric Furnaces Limited, of Watford, Herts., a number of appointments of sales engineers have been made. **Mr. C. A. McNeill** joins the Birmingham and East Midlands area under **Mr. G. W. Haines,** the area manager. Mr. McNeill was formerly with G.W.B. Furnaces Limited, of Dudley, and he has had considerable experience of electric furnaces, in particular large installations. **Mr. T. M. Morgan** takes over Wild-Barfield representation in South Wales and Monmouthshire, in addition to that of G.W.B. Furnaces Limited, whom he has represented for a number of years in this area. **Mr. A. V. Skelsey** takes over the newly-formed West Midlands territory.

Technical manager of Universal Metals Products, **Mr. Maurice Biddulph** has been appointed technical director.

After 40 years' service with the company, **Mr. C. E. G. Nye,** M.C., is retiring from the board of George Cohen Sons and Co. Ltd.

Joining B.B. Chemical Co. Ltd. from Tube Investments Ltd., **Dr. T. P. Hughes** is to be joint assistant-managing director. He joined T.I. in 1955, becoming their first Director of Research. He was for eight years at the Ministry of Supply, first as head of the Chemistry Department of the Royal Aircraft Establishment at Farnborough, and later as Chief Superintendent of the Rocket Propulsion Department.

With effect from October 1, 1961, three new appointments have been made by Vickers-Armstrongs (Engineers) Limited: **Mr. R. F. W. Keay** to be an additional member of the board and director of production engineering; **Mr. P. D. Scott Maxwell,** D.S.C., M.I.Mech.E., to be a special director and deputy general manager, Barrow works; **Mr. J. Hay,** A.M.I.Mech.E., A.M.I.Prod.E., to be a special director and works manager, Barrow works.

Mr. P. D. Scott Maxwell relinquishes his appointment as managing director of Cooke, Troughton & Simms Limited on taking up his appointment with Vickers-Armstrongs (Engineers) Ltd. but retains his seat on the board. He also relinquishes his appointments as: chairman and director of C. Baker Instruments Limited; director of Cooke, Troughton & Simms South Africa (Proprietary) Limited; president and director of Cooke, Troughton & Simms Incorporated; and director of Casella (Electronics) Limited.

Relinquishing his appointment as general manager of publicity at International Nickel Company (Mond) Limited, **Mr. A. C. Sturney** has been elected to the board with effect from September 4, 1961.

Mr. Sturney joined the International Nickel Company in 1927 as their representative in London, with the task of forming the first Bureau of Information on Nickel. On the merger between INCO and Mond in 1929 he became responsible for U.K. publicity and was made general manager of publicity in 1954.

Mr. Sturney will be succeeded as general manager of publicity by **Mr. L. F. Denaro,** who will relinquish his appointment as assistant to the managing director.

The resignations of **Mr. M. I. Freeman** and **Lord Kirkwood** from the board of The National Smelting Company Limited have been announced. **Mr. D. M. G. Sneddon** has been appointed chairman of The National Smelting Company Limited. **Mr. H. L. Whitworth-Jones** and **Mr. W. F. Watkinson** have been appointed directors.

Resigning from the board of Metal Traders Ltd., **Mr. R. H. C. Boys** is taking up an appointment with the International Nickel Co. (Mond) Ltd.

New appointments by Davy and United Engineering Company include **Mr. S. Baker,** who becomes general manager, **Dr. R. B. Sims,** director in charge of engineering, and **Mr. Alan Thomas** and **Mr. G. L. Carswell,** secretary and assistant secretary respectively.

After a 30-year association with William Blythe and Co., **Mr. C. E. M. Cheetham** has been appointed managing director. He joined the board four years ago.

The boards of two metal merchants, F. C. Larkinson and its associated company, Pinbrand Metals, have been augmented by the appointment of **The Earl of Listowel.**

Following the retirement of Mr. J. H. Pearce, **Mr. Timothy R. Summers,** of John Summers and Sons, has been appointed to the board of Ash and Lacy Ltd.

Vice-Chancellor of Oxford University in 1957 and 1958, **Sir John Masterman** is to become adviser on personnel matters to Birfield Industries.

Formerly with the research and engineering division of Monsanto Chemical Co., **Dr. Harold H. Zeiss** has been elected President and director of Monsanto Research S.A. of Zurich.

Appointments by Henry Simon (Holdings) Ltd. include: **Mr. E. G. Liebert,** director of manufacturing, Henry Simon (Holdings); **Mr. J. G. MacLean,** managing director Henry Simon (Engineering Works); **Mr. A. H. Bennett,** managing director, Turbine Gears; **Mr. G. E. Haywood,** director Henry Simon (Engineering Works).

A new director of research, **Capt. Maurice Luby,** R.N.(Retd.), has been appointed by High Duty Alloys Ltd.

Assisting in the design and operation of all equipment manufactured by Birlec-Efco, **Mr. Frank T. Bagnall,** who recently retired from Samuel Fox & Company Limited, Sheffield, has made his services available exclusively to Birlec-Efco (Melting) Ltd.

Responsible for development activities of the Climax Molybdenum Company in France, Luxemburg, Belgium and Spain, **Mr. F. J. Maratray** has been appointed as development manager of the Paris office of the company, a division of American Metal Climax, Inc.

Industrial News

Home and Overseas

Autumn Golf Meeting

Final details of the arrangements for the Autumn Meeting of the **National Association of Non-Ferrous Metal Merchants Golfing Society** have now been completed. The dinner will be held at the Midland Hotel, Birmingham, on Wednesday, October 4, at 6.45 p.m. for 7.30 p.m. One dining guest per member will be allowed.

The golf meeting will take place on the following day, Thursday, October 5, at Copt Heath Golf Club, Solihull. Play will start at 9.15 a.m. sharp. Two rounds will be played. In the morning, a Medal Round for the Captain's Cup, in which the Veterans will also be competing for the Ellis-Masur Cup. The scores will be converted to Stableford and combined with the Spring Meeting score to ascertain the Golfer of the Year. In the afternoon a Greensome (playing the selected drive of each couple) against Bogey for the Autumn Greensome Cup.

Players are requested to make their own arrangements for partners in the morning round. The secretary, Mr. G. B. Garnham, should be advised as soon as possible of members wishing to take part in the golf and if a caddy is required (if available). Those intending to be present at the dinner should also let the secretary know whether they will be inviting a guest.

Plate Cutting

A portable lightweight oxygen cutting machine, "The Pug", is now being marketed by British Oxygen. It weighs only 21 lb. Running on inexpensive light alloy track, the machine can make a straight cut of any length. Circles, from 3 in. to 45 in. in diameter, can be cut with the use of an adjustable trammel attachment. The cutter can be moved through angles up to 45 deg. for bevelling and can be adjusted vertically and laterally; it has a speed range of 7·3 to 36 in/min.

The nozzle-mixing blowpipe — for trouble-free and safer cutting—uses acetylene or propane as fuel gas. Another feature is a wrap-round handle for easy carrying and protection.

Light Alloys for Bulk Transport

Six 7 ft. diam. by 16 ft. long aluminium-magnesium alloy vessels are being fabricated at the works of **George Clark and Sons (Hull) Ltd.** — a Newman Hender Group company—as part of a new idea by British Railways for the quicker road-rail bulk transport of flour.

The main contractors for the project, **The Duramin Engineering Co. Ltd.,** fit the tanks to special transportable cradles designed to be transferred quickly by overhead crane from road to rail vehicle —or vice versa.

Loading and unloading of the flour is by compressed air, and the tanks have to withstand a test pressure of 30 lb/in^2.

A complete prototype unit has been tested successfully by British Railways and the six additional units now being made will enable full-scale trials to be carried out.

The specialized tank and its system of discharge is suitable for other applications. Duramin is already working on a project for carrying a payload of 15 tons of cement powder using the same principle but with the tank mounted permanently on a commercial road vehicle chassis.

Data on Magnesium Alloys

A revised edition of "Magnesium Data Book"—a compendium of useful facts about magnesium with special reference to "Elektron" alloys—has been issued by **Magnesium Elektron Limited,** 5 Charles II Street, St. James's, S.W.1.

It contains data on the composition and physical properties of typical alloys, their characteristics, surface treatment, forming, joining, and machining.

Technology of Secondary Metals

Forms of application for admission to the course on "Technology of Non-Ferrous Secondary Metals" beginning at the College of Advanced Technology Birmingham, on Wednesday, October 11, 1961, are now available, and may be obtained by members from the Secretary, National Association of Non-Ferrous Scrap Metal Merchants, Africa House, Kingsway, London, W.C.2.

Non-members of the Association may obtain application forms from the Department of Metallurgy, College of Advanced Technology, Gosta Green, Birmingham.

Lead Cable Sheathing

A booklet has recently been produced by the **Lead Development Association** entitled "Production, Properties and Uses of Lead Cable Sheathing". Although the number of sheathing materials available for electric cables has increased in recent years, lead sheaths are easily manufactured, extremely reliable in service and relatively cheap. It is therefore felt that there is a need to supply accurate and up-to-date information on various aspects of the manufacture and use of lead for cable sheathing and this publication, the first in a new series, serves as a general introduction to the subject.

The booklet, and information on all applications of lead, may be obtained from the Association at 34 Berkeley Square, London, W.1.

Flexible Pipes and Hose

The Blyth depot of **Singlehurst Equipment Ltd.,** specialists in industrial hose and high pressure flexible pipes and fittings, has been transferred to 29 Carlton Street, Blyth, Northumberland. The depot remains under the management of Mr. Angus Galloway.

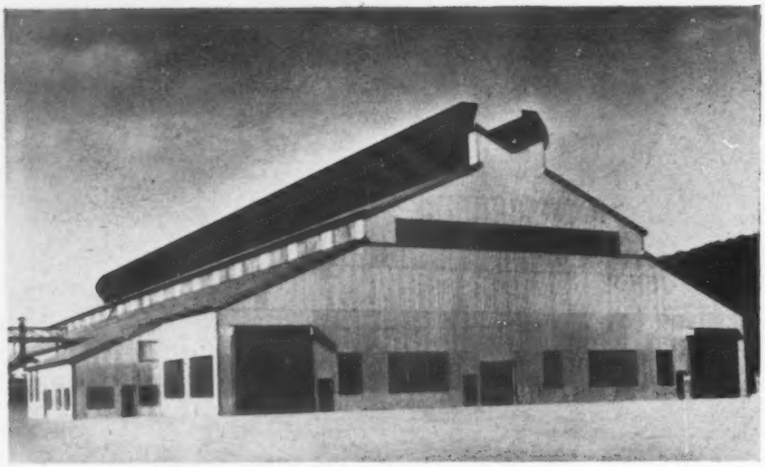
Coated Titanium Anodes

An agreement to pool their appropriate patents and collaborate to develop and extend the use of titanium anodes coated with an extremely thin film of platinum or similar metal has been reached by **Imperial Chemical Industries Ltd., Magneto-Chemie N.V.,** Schiedam, Holland, and **The Amalgamated Curacao Patents Co.,** of Curacao.

For some years these firms have been separately engaged in developing coated titanium anodes and independently found that potentially they offered very considerable advantages over conventional materials in industrial electrolytic cells for chemical manufacture, electroplating plant and equipment for converting brine to drinking water.

The Metals Division of I.C.I. are marketing platinized titanium anodes, which are being manufactured in Great Britain by their subsidiary, Marston Excelsior Ltd., of Wolverhampton.

Aluminium-magnesium tank for bulk transport of flour on British Railways being completed at the works of George Clark and Sons (Hull) Ltd.



Factory building equipped with one of the Monitor range of large ventilators

Giant Monitor Ventilator

Designed for the "hot-spots" of industry—glass furnaces, forge shops, heat-treatment and die-casting buildings —in fact, wherever fierce heat and fume conditions have to be dealt with quickly, Monitor ventilators have been used extensively for over ten years in the U.S.A. These ventilators have now been introduced to this country by Robertson Thain Ltd., Ellesmere Port, Wirral, Cheshire. One of the range is 30 ft. across. There are generally no moving parts to maintain and the ventilators are clad in protected metal sheets, ensuring a long service life. They are available in any length and several sizes. For obvious reasons Monitors are specifically designed to suit each particular application.

Birmingham News

Quiet conditions have continued in Midland industry during recent weeks. The momentum of the motor and associated industries has been disturbed once again by a strike, and unless this is settled quickly it is feared short time working will spread in the motor works.

Buying of raw material has been only moderate in the metal market as consumers appear to have stocks for current needs. The light engineering industries continue fairly busy. Most makers of machine tools have a fair amount of work on the books although new business slowed down during the holiday season.

Although business in heavy iron and steel continues to decline, the foundries have kept up a high output of iron castings. This has been due to the considerable trade in castings used in the building industry, engineering and heavy commercial vehicles. Deliveries of nearly all grades of rolled steel have been speeded up during the last few months. With less steel required by the home market, exporters are making strenuous efforts to develop overseas business. A substantial tonnage of steel sheet is being used in the motor industry. Re-rollers have fair order books for reinforcing rods and bars used in building construction.

Export Licensing Control Changes

Certain changes by the Board of Trade in export licensing control come into force on September 12. The changes result from amendments to the list of goods subject to embargo for the Soviet bloc and China.

The main changes are:

(a) Export control is removed from refractory goods, monochlorodifluoromethane and specified zirconium oxide, irrespective of destination, and from specified vacuum induction furnaces if destined for the Commonwealth, the Irish Republic or the United States of America.

(b) Control is imposed on the export of tritium and certain tritium compounds, specified manufactures of beryllium, specified calcium, hafnium metal and alloys and compounds to all destinations, and on the export of specified components of electronic computers and on specialized parts of specified vacuum induction furnaces to countries other than Commonwealth countries, the Irish Republic and the United States of America. Control on the export of specified zirconium compounds is extended to exports to the Commonwealth, the Irish Republic and the United States of America.

(c) The descriptions of goods to which export control applies have been amended in the case of centrifuges, dosimeters, electrolytic cells, heat exchangers, nuclear reactors, specified direction finding equipment, control equipment, electronic and precision instruments and apparatus, cathode-ray oscilloscopes, electronic cathode-ray tubes, vacuum tubes and valves, photo-electric cells, radio transmitters and transmitter amplifiers, recording and reproducing equipment, nickel powder and ball and roller bearings.

The Order making these changes and amending the Export of Goods (Control) Order, 1960, is the Export of Goods (Control) Order, 1960, (Amendment No. 3) Order, 1961 (S.I. 1961 No. 1604) and copies are obtainable from H.M. Stationery Office, Kingsway, London, W.C.2, and branches, price 6d. (by post 8d.).

Forthcoming Meetings

September 12—Institute of Metal Finishing. South West Branch. Royal Hotel, Cardiff. "Tin and Tin Alloy Plating." W. R. Angles. 7.30 p.m.

September 12—Institution of Works Managers. Birmingham Branch. Crown and Cushion Hotel, Perry Barr, Birmingham. British Petroleum Cocktail Party and Film Show. 7 p.m.

September 12—Aluminium Development Association. Department of Metallurgy, University of Nottingham. Three-day Conference on Anodized Aluminium.

September 13—Society of Instrument Technology. East Midland Section. Loughborough College. One-day Conference. "The Application of Instrumentation to Industrial Processes." 9.30 a.m.

September 14—Institute of Metal Finishing. North West Branch. Engineers' Club, Albert Square, Manchester. "Water Soluble Resin Paint Finishes." G. Phillips. 7.30 p.m.

Applied Physical Chemistry

A course of ten lectures on "Applied Physical Chemistry for Metallurgists" will be given by J. Mackowiak, Ph.D., A.I.M., at **Battersea College of Technology,** on Wednesdays, 6.30-9 p.m., commencing October 11, 1961. This course has been designed to meet the needs of those employed on research and production who either completed formal studies some years ago, or whose professional training did not include any previous study of the subject. Ample opportunity will be given for questions and discussion. The syllabus will include: Electron Theory of Elements and Molecules; Thermodynamics; Kinetics; and Application to Practical Problems. The course fee is £1, and enrolment forms may be obtained from the Secretary (Metallurgy Courses), Battersea College of Technology, London, S.W.11.

Financing Industry

Arranged by the **Institution of Production Engineers,** the 1961 Sir Alfred Herbert Paper "Finance for Industrial Growth", will be presented by Mr. D. L. Donne, M.A. (executive director, Charterhouse Industrial Development Company Ltd.), in the Lecture Theatre, The Royal Aeronautical Society, 4 Hamilton Place, London, W.1, on Tuesday, October 17, 1961, at 6.30 p.m., and the chairman will be Mr. Harold Burke, M.I.Prod.E. (President of the Institution). Tea will be served from 5.30 to 6.15 p.m.

Mr. Donne will describe the problems of finding and providing finance for growing industrial companies and, in particular, the features that a City Institution looks at when considering the provision of additional finance.

The Paper will be followed by open discussion.

The Meeting will be open to both members and non-members of the Institution, but admission will be by ticket only, applications for which should be made to the secretary at 10 Chesterfield Street, Mayfair, London, W.1.

Die-Casting Business Transferred

Assets and goodwill of the die-casting business of Sparklets Ltd., a member of the British Oxygen group, have been acquired by Fry's Diecastings Ltd.

This transaction does not in any way affect the business of Sparklets works as manufacturers of soda syphons, fire tubes and other small gas cylinders, inflation apparatus, etc., and B.O.C. retains its interests and rights in vacuum die-casting patents. Machines and equipment will

be transferred to the purchasers' factories over the next few months.

Aviation Instruments

An Aviation Division which will in future handle all enquiries and orders for the Negretti & Zambra Limited range of instruments and control units used in the aircraft industry has been formed.

Metal Exchange Stocks

Stocks of refined tin in London Metal Exchange official warehouses at the end of last week fell by 73 tons to 5,628 tons, comprising London 2,535, Liverpool 1,767 and Hull 1,326.

Copper stocks fell by 75 tons to 21,714, comprising London 650, Liverpool 17,014, Birmingham 50, Manchester 3,925, Hull 50 and Glasgow 25.

Lead duty-free stocks fell by 350 tons to 7,256 tons, comprising London 6,981, Glasgow 100 and Swansea 175. In-bond stocks rose by 100 tons to 2,902 tons, all in London.

Zinc duty-free stocks fell by 125 tons to 3,741, comprising London 2,622, Glasgow 96, Hull 325, Manchester 400 and Liverpool 298. In-bond stocks fell by 76 tons to 2,859, all in London.

Technical Information Office

On and from September 11, 1961, the Information Division of the Department of Scientific and Industrial Research will be at State House, High Holborn, London, W.C.1, Telephone Chancery 1262, where communications should be addressed.

Welding Stainless Steel

A range of stainless steel welding electrodes, under the name of "Supa-Stainway", has been introduced by **Invicta Electrodes Ltd.** Supa-Stainway "M" deposits a weld metal of the 18 per cent chrome, 8 per cent nickel, 2¾ per cent molybdenum type.

Other types shortly to be available include Supa-Stainway "S" (18 per cent chrome, 8 per cent nickel, 1 per cent niobium deposit) and Supa-Stainway 25/20 (25 per cent chrome, 20 per cent nickel deposits).

Teach, Don't Preach

Safety posters often come in for adverse criticism, especially the "don't do this or that" type. The British Safety Council believe that "teaching" posters can play a valuable part in industrial safety, and have recently launched a new "Case History" series along these lines.

The new posters — the first four are being distributed to over 7,000 factories and workplaces in Great Britain—illustrate the cause of common accidents, and suggest their simple prevention. The series will cover all aspects of safety in industry, and will be invaluable to safety officers.

Pallet for Simpler Transport

A standard form of collapsible post or box pallet has been introduced by **E. Stephens and Son Ltd.,** 58-66 Bath Street, London, E.C.1. It can be supplied to any size requirement and yet, in its collapsed form, has an approximate height of only 8 in., thus conforming to Railway return travel requirements. They can also be stacked with any other makes.

The detachable sides, which can be mesh or sheet are easily and quickly removed, replaced or exchanged, and although there are no buttons, screws or catches involved, there is no risk whatsoever of their coming adrift in the collapsed position.

Aluminium Products for Building

Marketing for the first time, through its Building Products Division, a range of products designed for the building industry, **James Booth Aluminium Ltd.** has also set up, under the direction of Mr. E. H. Laithwaite, B.Sc. Tech., a new technical advisory service to architects, builders, plumbers, etc., dealing with the application and installation of products made from aluminium and aluminium alloys.

A special building products warehouse at the Argyle Street works, Birmingham, will supply from stock architectural extrusions, corrugated and troughed building sheets, flashing and roofing coil, and the associated fixing accessories.

New plant and equipment is being acquired, as part of the company's overall expansion programme, to enable an even wider range of aluminium building products to be produced.

Fume and Dust Control

For the past 40 years, **The Visco Engineering Co. Ltd.** has supplied air filtration, fume removal, dust collection, water cooling and ventilating equipment to industry. Under its new name of **Visco Limited** it will continue manufacturing these and other specialized equipment such as their recently introduced Visco Isokinetic Fume Sampling Apparatus (V.I.S.A.), at their factories in Stafford Road, Croydon, Surrey, and Port Causeway, Bromborough, Cheshire.

Factory for Hydraulics

Negotiations have been concluded for **The Plessey Company Limited** to lease from the Swindon Corporation a further 50,000 ft^2 factory at Cheney Manor, Swindon.

The factory which is close to the existing Plessey factory group at Cheney Manor, is expected to be used for expansion of the company's Industrial Hydraulics Division.

Process Control

The complete range of electrical recording instruments made by the Esterline Angus Instrument Company Inc., of Indianapolis, U.S.A., is to be sold in the U.K. and Eire by **Elliott Brothers (London) Limited,** a member of the Elliott-Automation Group.

Portable Electrical Tools

A wider range of power tools is expected to be available to Britsh industry as a result of the acquisition by **Black and Decker Ltd.** of the Italian firm, Star. The Star plant, located at Civate in the Italian Alps, near Lake Como, has an area of 86,000 ft^2. It is of the most modern design, and further expansion could nearly double the size of the plant on its present site. Sales of Star products in 1961 are estimated to total $2,000,000.

"Operation Jones"

For Farnborough Air Show two Jones cranes performed the tricky job of hoisting Britain's space rocket, Blue Streak, from its transporter to its exhibition pad.

Some 72 ft. high and 10 ft. in diameter, Blue Streak weighs less than five tons when its great fuel tanks are empty. Its casing is made of stainless steel less than 0·02 in. thick, and to give the rocket the strength it needs to support its own weight, the liquid oxygen fuel tank is filled with compressed nitrogen. In its unfuelled state, it is virtually a stainless steel "balloon". It cost several hundred thousand pounds to build — and over £70,000,000 to design and test.

The essential factors when planning the lift were to ensure that the load stresses were concentrated on the anchor points at the base and on the nose. At no time could the 90 ft. jib of the main crane be allowed to veer from the centre line of the missile.

Blue Streak Rocket being hoisted to an angle of 60° by a Jones KL12-20 crane when the rocket reached the point of balance. A KL66 crane completed the movement

Lying horizontally on its transporter, the rear of the rocket was fixed to a specially-designed cradle hinged to the tarmacadam show site. A Jones 20-ton KL 12-20 crane, with a 90 ft. jib, and a Jones 6-ton KL 66, with a 25 ft. swan neck jib, were successfully used for the job.

"Operation Jones" substituted the normal rocket erection practice in which special towers are used.

Easier Machining Beryllium Copper

A new process developed by Johnson, Matthey and Co. Ltd. removes beryllia from the surfaces of beryllium-copper strip, and the improved material is supplied at no extra cost and all Mallory 73 beryllium-copper strip up to 0·025 in. thick will, in future, be supplied with beryllia-free surfaces. This will reduce tool wear without affecting the mechanical properties of the alloy.

Undue tool wear is attributable to the presence of beryllia, a hard and abrasive oxide of beryllium that is formed during the solution heat-treatment of the alloy. The oxide is colourless and is not removed by normal cleaning or pickling methods, so that it is often present on material that appears to have a good surface finish.

British Magnesium Project

Plans are in hand for Magnesium Elektron Limited, now a wholly-owned subsidiary of The British Aluminium Co. Ltd., to erect a plant of 5,000 tons/yr. capacity at Hopton, near Wirksworth, in Derbyshire, to extract magnesium of 99·9 per cent purity from the local dolomite by a thermal process, at present operated successfully by Dominion Magnesium Limited of Canada.

The completion of the Hopton plant will make the U.K. largely independent of imports from overseas of this strategically important light metal. The dolomite deposits and the plant equipment and layout are such as to permit further expansion to meet increasing demand for the metal.

The Hopton plant will employ about 180 men. There will be no direct effect on employment at the company's existing facilities at Clifton Junction because pure metal produced at Hopton will replace metal at present imported and utilized at Clifton Junction.

Separate Company Formed

A limited company under the chairmanship of Mr. A. T. Thorne is being formed by The Manganese Bronze and Brass Company Ltd. from its Deans and Lightalloys Division. Mr. Thorne is a director of the parent company.

Discharge of Trade Effluent

Recent legislation affecting manufacturers, electroplaters and others discharging industrial waste waters to rivers and to public sewers is briefly summarized below.

The Rivers (Prevention of Pollution) Act, 1961 amends the Rivers (Prevention of Pollution) Act, 1951. Under the 1951 Act, "new" discharges of trade and sewage effluent to rivers (i.e. those made since 1951) need the consent of, and are subject to conditions imposed by a river board. Under the 1961 Act, "old" discharges of such effluents (i.e. those made pre-1951) will now be made subject to the same control.

Those traders, therefore, who have been discharging trade effluent since before 1951 and have not required the consent of the river board must now make application for the board's consent. It will be unlawful to make a discharge of trade or sewage effluent without such a consent on and after a date yet to be appointed by the Minister, which date shall be not less than 14 months from July 27. Three months are allowed from the giving of the consent for the recipient to appeal against the unreasonableness of any terms in the consent: Consents may be reviewed at 2-yearly intervals by the river board.

Public Health Bill — Under the provisions of the Public Health (Drainage of Trade Premises) Act, 1937, local authorities are empowered to make charges and impose conditions on those effluents until now exempted. Local authorities will also be empowered to require more detailed information than hitherto about effluents discharged to sewers and will be enabled to review and vary consents at 2-yearly intervals.

These two new measures represent far-reaching changes in the present legislation dealing with the discharge of effluents to rivers and to public sewers. They warrant careful study by those affected by their provisions. Copies of these measures should shortly be available from H.M.S.O. In the meantime, firms who are members of F.B.I. are invited to get in touch with the Technical Department in case of difficulty. A revised F.B.I. booklet on the law relating to the discharge of trade effluent to take account of these changes is in course of preparation.

Automation in Metal Processing

A new company to operate independently is being formed from the AEI-Davy - United Steelworks Automation Unit. The AEI and Davy-Ashmore interests in the application of automation to the processing of steel and non-ferrous metals are now combined in a jointly owned company, **Davy-AEI Automation.** The chairman is Mr. M. A. Fiennes, managing director of Davy-Ashmore; vice-chairman, Mr. C. R. Wheeler, who is vice-chairman of AEI.

Company Reports

Ash and Lacy

Group net profit £61,337 (£66,093), after taxation £68,220 (£69,455). Dividend 17½ per cent, Preference dividend £1,800 (same), Ordinary £21,438 (same), retained by subsidiary £2,495 (£3,550), to general reserve £30,000 (same), increase in carry-foward £5,604 (£1,573).

British Aluminium Co. Ltd.

The British Aluminium Company Limited announces that it has purchased the 40 per cent shareholding of The Distillers Company Limited in Magnesium Elektron Limited, with effect from July 7, 1961, which, with the 60 per cent the company already owns, makes that company a fully-owned subsidiary of The British Aluminium Company Limited.

George Cohen 600 Group Ltd.

Net profit contracted from £785,071 to £644,808. Dividend was repeated at 13 per cent with the final of 8½ per cent on increased capital. Fixed assets rose from £4,064,778 to £4,301,692, and commitments were estimated at £447,000 (£268,000). Net current assets increased from £9,631,467 to £12,586,852.

Davy-Ashmore Ltd.

Group net profit of parent company £2,115,889 (£1,231,020). Dividend 27½ per cent (25 per cent forecast). Fixed assets increased from £4,465,191 to £9,421,293, and commitments were estimated at £893,000 (£509,000). Net current assets amounted to £7,519,011 (£4,049,202). Reserves rose from £2,678,337 to £6,867,421.

Murex Ltd.

Group net profit £691,306 (£706,942). Dividend 13 per cent (12·86). Year-end net assets amounted to £7,756,115 (£7,427,440) and included fixed assets of £3,293,450 (£3,064,175) and net current assets of £4,277,629 (£4,223,229).

New Companies

The particulars of companies recently registered are quoted from the daily register compiled by Jordan and Sons Limited, Company Registration Agents, Chancery Lane, W.C.2.

Pearless Aluminium (Die - Castings) Limited (699724), Priory Road, Aston, Birmingham. Registered July 31, 1961. Nominal capital, £100 in £1 shares. Directors: Leslie L. Jones, William S. Jordan, Alan G. Jones, Charles M. Jordan and William H. Robb.

J.K.B. Safes Limited (700153), 101 Lord Street, Wolverhampton. Registered August 4, 1961. To take over the business of lock manufacturers, safe engineers, brass founders and hardware merchants and other businesses carried on by Joseph and Edward Bates and Sons Ltd. at Scarboro' Works, Temple Street, Wolverhampton, etc. Nominal capital, £2,000 in £1 shares. Directors: Horace V. H. Bates and John K. Bates.

JCS (Pressings) Limited (699982), Hollypash Mills, Calverley, nr. Leeds. Registered August 2, 1961. To carry on the business of pressers' furnishers, engineers, founders, smiths, manufacturers and patentees of metals of all kinds, etc. Nominal capital, £100 in £1 shares. Directors: John C. Sugden and Mary Sugden.

Elmbridge Plating Company Limited (700043), 83-5 St. Mary Road, Walthamstow, E.17. Registered August 3, 1961. Nominal capital, £1,000 in £1 shares. To carry on business of electroplaters, etc. Directors: Richard A. Lane and Elsie E. Lane.

Nathan Tin Stamping Ltd. (700160), Nathan Way, Woolwich Industrial Estate, Woolwich, S.E.18. Registered August 4, 1961. Nominal capital, £100 in £1 shares. Directors: Reginald Bennett and Bernard W. Fitchie.

Metal Market News

THE copper market has enjoyed about two months of almost complete stability around a price of £230 for cash, rather over than under that level. Prior to that, the quotation ruled somewhat higher but changes in value were not great and certainly nobody can complain of the erratic nature of values in the copper ring. The end of last week saw the beginning of the fourth week of the Chilean strike, and yet there was very little alteration in values from the previous Friday. The fact is, of course, that so far the users have just refused to accept the Chilean situation as a threat to their supplies, but how much longer they will continue to adopt this attitude of indifference remains to be seen. As we write, the position in Chile looks like being a continued deadlock but, obviously, sooner or later the trouble must be resolved somehow or other. *Force majeure* has been declared by both the companies concerned, so that their customers have been warned that a shortage of supplies may develop. The fact that Metal Exchange stocks of copper were reported at the beginning of last week lower by 50 tons to 21,789 tons may, perhaps, be regarded as a sign that a change is at hand. This is the first occasion for very many weeks that the level has moved down rather than up, for the rise in tonnage has persisted since the beginning of May.

The make-up of the reserve of standard copper lying in Metal Exchange warehouses consists almost entirely of fire refined metal and there cannot, of course, be any doubt that it is eminently suitable for operations in the U.K. mills. It is, in fact, a very useful stand-by for British consumers and is not very likely to be withdrawn for shipment abroad. Very little change was seen in the quotation last week, the most interesting development being a widening in the contango to £3 5s. 0d. At the close, cash was 25s. higher at £233 5s. 0d., while three months had gained 35s. to £236 10s. 0d. In the circumstances of the continued Chilean strike, a firm market is understandable even though consumer demand remains at a low ebb, but the surprising thing is that a much more pronounced upward trend has not so far developed. Output at the rate of about 1,400 tons per day is being lost, so that by now upwards of 40,000 short tons has been lost. The turnover on the standard copper market last week was about 14,000 tons.

The reaction in tin proved to be very short-lived, and last week saw the quotation forging ahead again quite strongly. A feature of the market was the narrowing of the contango from £6 to £1, the rise in the cash price being no less than £27. Following a turnover of nearly 2,000 tons, the close was £994 for cash and £995 for three months, the forward quotation gaining £22. Majority opinion favours a price well over £1,000 per ton. Lead was a disappointing market although fairly active with a turnover of nearly 8,000 tons. On balance, cash lost 17s. 6d. and three months 12s. 6d., to close at £64 12s. 6d. and £66 7s. 6d. Some 8,000 tons of zinc changed hands, both positions gaining 12s. 6d. to close at £75 10s. 0d. and £76 7s. 6d. cash and forward.

New York

At the close of last week copper futures were slightly higher, but the trading pace slowed as pre-holiday influences prevailed, the market being closed for Labour Day. Physical copper continued firm. The large producers were booking normal business and the custom smelters report good demand for September copper and some inquiry for October. Scrap copper continued tight and prices were firm. Copper for export was firm but little or no business was reported. Little prospect appeared of the end of the Kennecott or Chilean labour difficulties.

Lead was moderately active. Sales for the week were estimated at 13,159 tons compared with 12,556 tons in the previous week. Zinc was also described as moderately active.

Tin was quiet and prices held. In the later stages, custom smelters reported fair business. In zinc, good business was reported for prime western grade for September and there was better inquiry for October.

Zurich

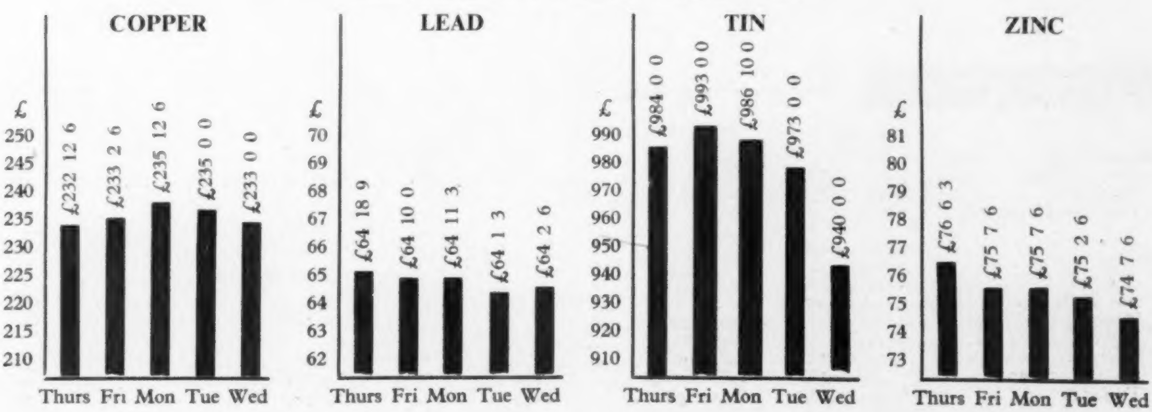
Business improved on the Swiss non-ferrous metal market in the second half of August, following very quiet conditions in the first half of the month. Increase in turnover was believed to be entirely seasonal. No sizeable purchases for storage in view of the world situation were noted. On the contrary, consumers adopted a waiting attitude.

The recent increase in demand referred chiefly to copper and tin. Lead purchases did not increase to any large extent and there was no change in the zinc situation. There was some decline in offerings of copper and tin. Copper was still available at short notice but longer delivery dates were asked for tin.

Price movements in August were seasonally irregular. While quotations of copper and tin increased substantially, zinc declined somewhat in price. There was no change in lead, nickel and aluminium.

London Metal Exchange

Thursday 31 August to Wednesday 6 September 1961



NON-FERROUS

PRIMARY METALS

All prices quoted are those available at 2 p.m. 6/9/61

		£	s.	d.
Aluminium Ingots	ton	186	0	0
Antimony 99·6%	,,	237	10	0
Antimony Metal 99%	,,	230	0	0
Antimony Oxide				
Commercial	,,	194	10	0
Antimony White Oxide	,,	212	0	0
Arsenic	,,	400	0	0
Bismuth 99·95%	lb.		16	0
Cadmium 99·9%	,,		11	0
Calcium	,,	2	0	0
Cerium 99%	,,	15	0	0
Chromium	,,		6	11
Cobalt	,,		12	0
Columbite	per unit	8	0	0
Copper H.C. Electro	ton	233	0	0
Fire Refined 99·70%	,,	232	0	0
Fire Refined 99·50%	,,	231	0	0
Copper Sulphate	ton	78	0	0
Germanium	grm.		—	
Gold	oz.	12	10	6
Indium	,,		10	0
Iridium	,,	24	0	0
Lanthanum	grm.		15	0
Lead English	ton	64	2	6
Magnesium Ingots	lb.			
99·8%	,,		2	2½
99·9+%	,,		2	3
Notched Bar	,,		2	9½
Powder Grade 4	,,		5	6
Alloy Ingot, AZ91X		1	11¾-2	1¼
Manganese Metal	ton	280	0	0
Mercury	flask	63	0	0
Molybdenum	lb.	1	15	0
Nickel	ton	660	0	0
F. Shot	lb.		5	11
F. Ingot	,,		5	11
Osmium	oz.	20	0	0
Osmiridium	,,		—	
Palladium	oz.	9	0	0
Platinum	,,	30	5	0
Rhodium	,,	46	0	0
Ruthenium	,,	16	0	0
Selenium	lb.	2	6	6
Silicon 98%	ton	123	0	0
Silver Spot Bars	oz.		6	7¾
Tellurium Sticks	lb.	2	0	0
Tin	ton	940	0	0
***Zinc**				
Electrolytic	ton		—	
Min 99·99%	,,		—	
Virgin Min 98%	,,	74	18	9
Dust 95/97%	,,	121	10	0
Dust 98/99%	,,	127	10	0
Granulated 99+%	,,	99	18	9
Granulated 99·99+%	,,	112	8	9

**Duty and Carriage to customers' works for buyers' account.*

INGOT METALS

All prices quoted are those available at 2 p.m. 6/9/61

		£	s.	d.
Aluminium Alloy (Virgin)				
B.S. 1490 L.M.5	ton	210	0	0
B.S. 1490 L.M.6	,,	202	0	0
B.S. 1490 L.M.7	,,	216	0	0
B.S. 1490 L.M.8	,,	203	0	0
B.S. 1490 L.M.9	,,	203	0	0
B.S. 1490 L.M.10	,,	221	0	0
B.S. 1490 L.M.11	,,	215	0	0
B.S. 1490 L.M.12	,,	223	0	0
B.S. 1490 L.M.13	,,	216	0	0
B.S. 1490 L.M.14	,,	224	0	0
B.S. 1490 L.M.15	,,	210	0	0
B.S. 1490 L.M.16	,,	206	0	0
B.S. 1490 L.M.18	,,	203	0	0
B.S. 1490 L.M.22	,,	210	0	0
Aluminium Alloys (Secondary)				
B.S. 1490 L.M.1	ton	152	0	0
B.S. 1490 L.M.2	,,	152	0	0
B.S. 1490 L.M.4	,,	161	0	0
B.S. 1490 L.M.6	,,	176	0	0
***Aluminium Bronze**				
BSS 1400 AB.1	ton	245	0	0
BSS 1400 AB.2	,,	253	0	0
***Brass**				
BSS 1400-B3 65/35	ton	178	0	0
BSS 249	,,		—	
BSS 1400-B6 85/15	,,	225	0	0
***Gunmetal**				
R.C.H. 3/4% ton	,,		—	
(85/5/5/5) LG2	,,	220	0	0
(86/7/5/2) LG3	,,	231	0	0
(88/10/2/1)	,,	293	0	0
(88/10/2/½)	,,	304	0	0
***Manganese Bronze**				
BSS 1400 HTB1	,,	196	0	0
BSS 1400 HTB2	,,	215	0	0
BSS 1400 HTB3	,,	230	0	0
Nickel Silver				
Casting Quality 12%	,,	265	0	0
,, ,, 16%	,,	275	0	0
,, ,, 18%	,,	320	0	0
***Phosphor Bronze**				
B.S.1400P.B.1.(A.I.D. released)	,,	320	0	0
B.S. 1400 L.P.B.1	,,	245	0	0

**Average prices for the last week-end.*

		£	s.	d.
Phosphor Copper				
10%	ton	257	0	0
15%	,,	260	0	0
Phosphor Tin				
5%	,,	1020	0	0
Silicon Bronze				
BSS 1400-SB1	,,	285	0	0
Solder, soft, BSS 219				
Grade C Tinmans	,,	438	5	0
Grade D Plumbers	,,	346	10	0
Grade M	,,	484	2	6
Solder, Brazing, BSS 1845				
Type 8 (Granulated)	lb.		—	
Type 9 ,,	,,		—	
Zinc Alloys				
BSS 1004 Alloy A	ton	105	18	9
BSS 1004 Alloy B	,,	109	18	9
Sodium-Zinc	lb.		2	6

SCRAP METALS

Merchants' average buying prices delivered, per ton, 5/9/61

	£
Aluminium	
New Cuttings	132
Old Rolled	102
Segregated Turnings	64
Brass	
Cuttings	161
Rod Ends	144
Heavy Yellow	137
Light	132
Rolled	147
Collected Scrap	134
Turnings	138
Copper	
Wire	209
Firebox, cut up	207
Heavy	206
Light	203
Cuttings	214
Turnings	194
Braziery	169
Gunmetal	
Gear Wheels	200
Admiralty	200
Commercial	180
Turnings	175
Lead	
Scrap	55
Nickel	
Cuttings	—
Anodes	590
Phosphor Bronze	
Scrap	180
Turnings	175
Zinc	
Remelted	69
Cuttings	60
Old Zinc	39

METAL PRICES

SEMI-FABRICATED PRODUCTS

Prices vary according to dimensions and quantities. The following are the basis prices for certain specific products

		£	s.	d.
Aluminium				
Sheet 10 S.W.G.	lb.		2	10¼
Sheet 18 S.W.G.	,,		3	0½
Sheet 24 S.W.G.	,,		3	3¼
Strip 10 S.W.G.	,,		2	10½
Strip 18 S.W.G.	,,		2	11½
Strip 24 S.W.G.	,,		3	1
Circles 22 S.W.G.	,,		3	4½
Circles 18 S.W.G.	,,		3	3¼
Circles 12 S.W.G.	,,		3	2¼
Plate as rolled	,,		2	10
Sections	,,		3	4
Wire 10 S.W.G.	,,		3	1½
Tubes 1 in. o.d. 16 S.W.G.	,,		4	4
Aluminium Alloys				
BS 1470. HS19W.				
Sheet 10 S.W.G.	,,		3	3
Sheet 18 S.W.G.	,,		3	5¼
Sheet 24 S.W.G.	,,		4	1
Strip 10 S.W.G.	,,		3	3
Strip 18 S.W.G.	,,		3	4¼
Strip 24 S.W.G.	,,		4	0½
BS1477. HP30M.				
Plate as rolled	,,		3	1
BS1470. HC15WP.				
Sheet 10 S.W.G.	,,		4	3
Sheet 18 S.W.G.	,,		4	8½
Sheet 24 S.W.G.	,,		5	8½
Strip 10 S.W.G.	,,		4	4
Strip 18 S.W.G.	,,		4	8½
Strip 24 S.W.G.	,,		5	4½
Aluminium Alloys—cont.				
BS1477. HPC15WP.				
Plate heat treated	lb.		3	10½
BS1475. HG19W.				
Wire 10 S.W.G.	,,		4	2
BS1471. HT19WP.				
Tubes 1 in. o.d. 16 S.W.G.	,,		5	5
BS1476. HE19WP.				
Sections	,,		3	4
Split tube				
19 S.W.G. (½")	,,		4	2
20 S.W.G. (⅝")	,,		3	11
21 S.W.G. (⅜")	,,		4	1
22 S.W.G. (¼")	,,		4	11
Welded tube				
14 to 20 S.W.G. (sizes ½" to 1½")	,,	3/10½ to 5/8½		
Brass				
Tubes	lb.		1	10½
Brazed Tubes	,,		3	2¼
Drawn Strip Sections	,,		3	2⅛
Sheet	ton	198	15	0
Strip	,,	198	15	0
Extruded Bar	lb.		2	0⅜
Condenser Plate (Yellow Metal)	ton	186	0	0
Condenser Plate (Naval Brass)	,,	199	0	0
Wire	lb.		2	8¾
Beryllium Copper				
Strip	lb.	1	4	11
Rod	,,	1	1	6
Wire	,,	1	4	9
Copper				
Tubes	lb.		2	3½
Sheet	ton	268	5	0
Strip	,,	268	5	0
H.C. Wire	,,	285	5	0
Cupro Nickel				
Tubes 70/30	lb.		3	8⅜
Lead				
Pipes (London)	ton	107	0	0
Sheet (London)	,,	104	15	0
Tellurium Lead	,,	£6 extra		
Nickel Silver				
Sheet and Strip 10%..	lb.		3	11½
Wire 10%	,,		4	4½
Phosphor Bronze				
Wire	,,		4	2½
Titanium (1,000 lb. lots)				
Billet 4½" to 18" dia...	lb.	47/-	48/-	
Rod ¼" to 4" dia.	,,	85/-	53/-	
Wire ·036"-232" dia...	,,	159/-	99/-	
Strip ·001" to ·048"..	,,	350/-	68/-	
Sheet 8'×2'. 20 gauge	,,	73/-		
Tube, representative average gauge	,,	198/-		
Extrusions	,,	90/-		
Zinc				
Sheet	ton	113	7	6
Strip	,,	nom.		

FOREIGN QUOTATIONS

Latest available quotations for non-ferrous metals with approximate sterling equivalents based on current exchange rates

Belgium	fr/kg	£/ton	
Copper: electrolytic	32.50	237	11
Tin	137.15	1,002	9

Canada	c/lb	£/ton	
Aluminium	26.00	210	12
Copper: electrolytic	30.00	243	0
Lead	10.50	81	0
Nickel	70.00	567	0
Zinc: Prime western	12.00	97	4
High grade 99.95 ..	12.60	102	1
High grade 99.99 ..	13.00	105	6

France	fr/kg	£/ton	
Aluminium	2.43	179	11
Antimony 99·0	2.80	206	18
Cadmium	16.25	1,200	17
Copper: electrolytic	3.28	242	8
Lead	.95	70	4
Nickel	9.00	665	2
Tin	14.00	1,034	12
Zinc: Thermic	1.11	82	0
Zinc: electrolytic....	1.19	87	5
Scrap			
Copper: electrolytic	2.87	212	2
Heavy copper	2.87	212	2
No. 1 copper wire ..	2.75	203	4
Brass rod ends......	2.10	155	3
Zinc castings	.92	67	18
Lead	.88	65	6
Aluminium	1.80	133	0

Italy	lire/kg	£/ton	
Aluminium	370	216	1
Antimony 99·0	485	283	4
Copper: wire bars 99.9	450	262	16
Lead	165	96	8
Nickel	1,300	805	14
Tin	1,840	1,074	11
Zinc: electrolytic....	181	105	15
Scrap			
Aluminium soft sheet clippings (new) ..	305	178	2
Lead, soft, first quality	137	80	0
Lead, battery plates ..	77	45	19
Copper, first grade ..	370	216	0
Bronze, commercial gunmetal	420	245	7
Brass: heavy	275	160	12
Brass: light	260	152	16
Brass, bar turnings ..	275	160	12
Old zinc	107	62	10

Switzerland	fr/kg	£/ton	
Aluminium	2.50	210	5
Copper: electrolytic	2.98	250	12
Lead	.80	67	5
Nickel	7.50	630	15
Tin	11.70	983	18
Zinc: High grade 99.99	1.03	86	12

Japan	Yen per metric ton
Scrap	
Copper: electrolytic ..	289,000
Copper wire No. 1....	268,000
Copper wire No. 2....	260,000
Heavy copper	260,000
Light copper	237,000
Brass, new cuttings....	197,000
Red brass scrap	217,000

West Germany	D-marks per 100 kilos	£/ton	
Scrap			
Used copper wire ..	225	205	0
Heavy copper	220	200	8
Light copper	190	173	1
Heavy brass	145	132	1
Light brass	110	100	5
Soft lead	50	45	11
Zinc	50	45	11
Used aluminium unsorted	75	68	6

United States	c/lb	£/ton	
Aluminium	26.00	207	4
Antimony 99·0......	32.50	259	0
Cadmium	160.00	1,275	4
Copper: electrolytic	31.00	247	10
Lead	11.00	87	13
Nickel	81.25	647	11
Tin	123.50	984	5
Zinc: electrolytic....	12.50	99	12

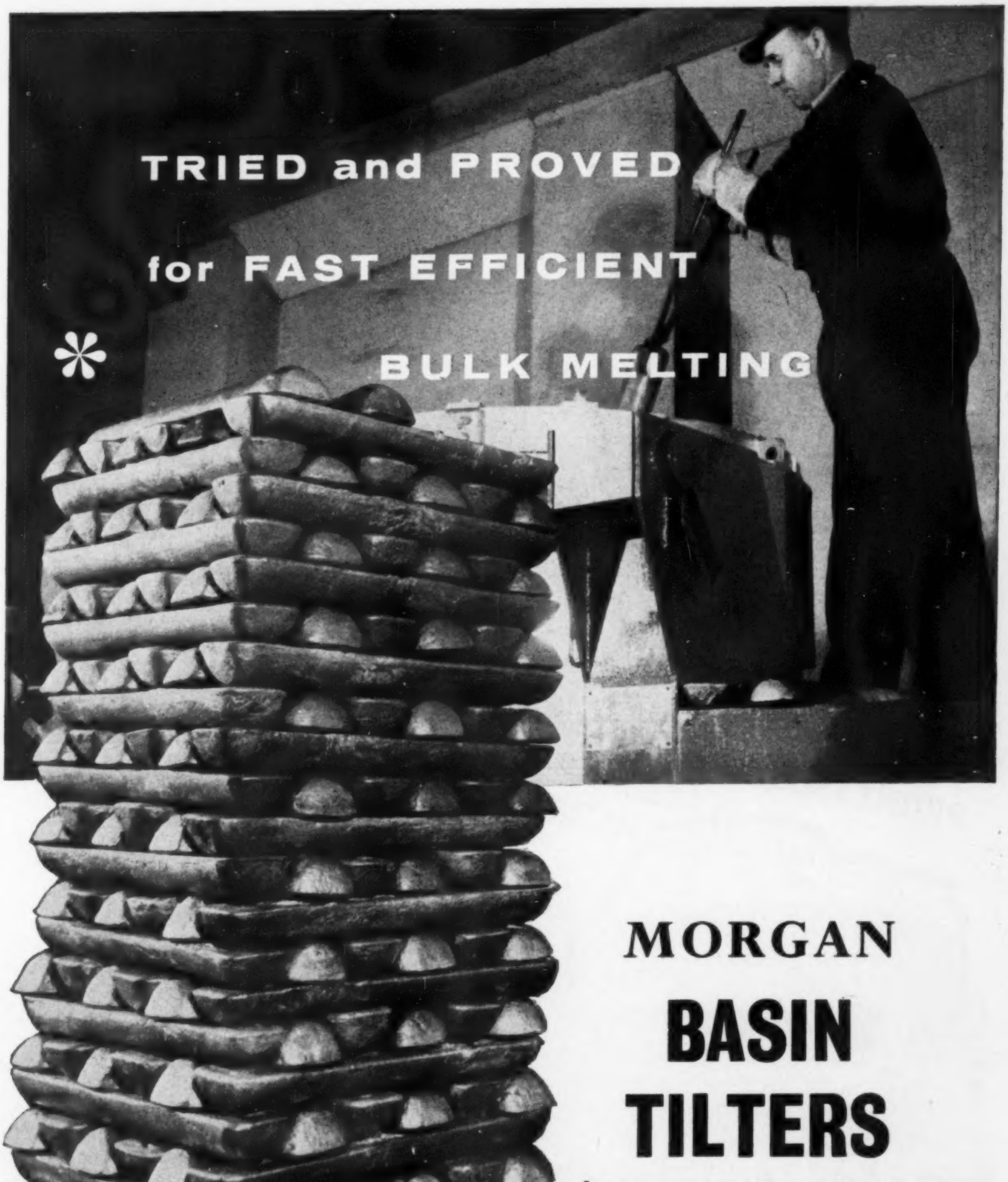
THE STOCK EXCHANGE

Firmer Tone But Business Remained Slow

ISSUED CAPITAL ●	AMOUNT OF SHARE	NAME OF COMPANY	MIDDLE PRICE 4 Sept. + RISE—FALL		DIV. FOR LAST FIN. YEAR	DIV. FOR PREV. YEAR	DIV. YIELD	1961 HIGH	1961 LOW	1960 HIGH	1960 LOW
£	£				Per cent	Per cent					
4,435,792	1	Amalgamated Metal Corporation ...	31/9	—9d.	11	9	6 18 6	33/9	26/3	35/–	26/6
400,000	2/–	Anti-Attrition Metal	1/3		NIL	4	NIL	1/3¾	0/9	1/6	0/9
43,133,593	Stk. (£1)	Associated Electrical Industries ...	38/–	+3/–	15	15	7 18 0	54/10½	35/–	67/3	38/3
3,895,963	1	Birfield	61/6		10	15‡	3 5 0	78/9	45/–	51/3	29/–
4,795,000	1	Birmid Industries	76/–	—6d.	20	20D	5 5 3	103/–	71/3	74/9	56/–
8,445,516	Stk. (10/–)	Birmingham Small Arms	21/9		17½QT	12½	5 7 3	36/10½	20/6	30/6	18/3
203,150	Stk. (£1)	Ditto Cum. A. Pref. 5%	12/6	—1/6	5	5	8 0 0	14/6	12/6	17/4½	14/9
476,420	Stk. (£1)	Ditto Cum. B. Pref. 6%	17/–	+1/–	6	6	7 1 3	17/6	15/6	20/–	17/*½
1,500,000	Stk. (£1)	British Aluminium Co. Pref. 6% ...	15/9		6	6	7 10 0	18/–	15/3	21/1½	17/7½
18,846,647	Stk. (£1)	British Insulated Callender's Cables	57/6		13½	13½	4 14 0	62/3	49/–	61/4½	47/–
7,670,837	5/–	British Oxygen Co. Ltd., Ord. ...	18/1½	—1½d.	16D	16	2 19 0	28/4½	17/6	35/–	19/10½
1,200,000	Stk. (5/–)	Canning (W.) & Co.	15/9	—6d.	15⅝	25+*2½C‡	5 0 6	20/9	13/7½	19/9	13/7½
60,484	1/–	Carr (Chas.)	1/1½		NIL	12½	—	1/7½	10½d.	2/3	1/–
555,000	1	Clifford (Chas.) Ltd.	29/6		12	10	8 2 6	31/–	26/–	35/–	28/9
45,000	1	Ditto Cum. Pref. 6%	15/–		6	6	8 0 0	15/3	15/–	16/–	15/10½
1,166,000	Stk. (2/–)	Clifford Components V	8/3	+3d.	25*2½C	25*2½C	6 1 3	10/1½	7/3	11/9	6/10½
300,000	2/–	Coley Metals	3/–		15	15	10 0 0	4/5½	3/–	5/–	3/4½
10,185,696	1	Cons. Zinc Corp.†	69/6	+6/6	20	15	5 15 0	81/6	63/–	80/9	59/6
5,399,056	1	Davy-Ashmore	138/9		27½	22½	3 19 0	177/6	129/6	147/3	99/6
8,000,000	5/–	Delta Metal	20/10½	+10½d.	20	17½	4 15 9	27/7½	19/9	28/3	18/6
5,296,550	Stk. (£1)	Enfield Rolling Mills Ltd.	39/3	—9d.	15	15	7 12 9	52/3	39/–	56/9	45/–
1,155,000	1	Evered & Co.	43/6		10	10 ϕB	4 12 0	45/9	42/6	42/9	29/3
18,000,000	Stk. (£1)	General Electric Co.	31/6	+2/6	10	10	6 7 0	39/6	29/–	47/9	29/–
1,500,000	Stk. (10/–)	General Refractories Ltd.	55/–		25	20	4 11 0	65/–	42/9	52/6	40/–
937,500	5/–	Glacier Metal Co. Ltd.	18/3		15	13	4 2 3	21/1½	13/9	16/1½	11/1½
2,750,000	5/–	Glynwed Tubes	25/–		22½	25¶	4 10 0	30/3	23/–	27/6	17/–
7,228,065	10/–	Goodlass Wall & Lead Industries ...	33/6	—3d.	15	19L	4 9 6	44/9	32/6	41/9	33/–
696,780	10/–	Greenwood & Batley	18/–		15	30‡	8 6 9	29/6	18/–	33/6	29/1½
792,000	5/–	Harrison (B'ham) Ord.	9/–	—3d.	*10	*20‡	5 11 0	14/6	9/–	15/10½	11/9
150,000	1	Ditto Cum. Pref. 7%	19/9		7	7	7 1 9	20/4½	19/7½	23/6	22/–
1,612,750	5/–	Heenan Group	13/–		13	15	5 0 0	17/1½	10/6	13/–	9/10½
251,689,407	Stk. (£1)	Imperial Chemical Industries ...	67/9		13¾	11½	4 1 3	81/6	63/1½	76/6	54/–
34,736,773	Stk. (£1)	Ditto Cum. Pref. 5%	14/3		5	5	7 0 3	16/–	13/10½	18/–	15/4½
29,196,118	**	International Nickel	148	—3	$1.60	$1.50	1 16 6	160	104	105	84¾
6,000,000	1	Johnson, Matthey & Co.	71/6		15	12	4 5 0	75/–	57/6	67/6	44/9
600,000	10/–	Keith, Blackman	17/6		17½	17½E	10 0 0	21/6	16/6	32/6	17/6
320,000	4/–	London Aluminium	11/9	—1½d.	13	12	4 8 6	15/–	8/6	12/6	7/10½
1,530,024	1	McKechnie Bros. A Ord.	35/–		12½K	17½F	7 2 9	53/3	35/–	69/3	55/–
1,108,268	5/–	Manganese Bronze & Brass ...	13/6		20⅝	20⅝	7 14 3	18/6	12/7½	18/6	13/4½
50,628	6/–	Ditto (7½% N.C. Pref.)	5/6		7½	7½	8 3 6	6/–	5/–	6/6	5/9
26,361 444	Stk. (£1)	Metal Box	82/–	+6d.	12	12M	2 18 6	100/9	68/3	84/3	61/–
415,760	Stk. (2/–)	Metal Traders	7/6		50	50	3 6 9	8/9	6/9	10/9	7/1½
160,000	1	Mint (The) Birmingham	33/9		15G	12½	5 18 3	35/9	24/–	39/–	33/6
80,000	5	Ditto Pref. 6%	71/6		6	6	8 7 9	77/6	71/6	80/–	75/–
274,152	1/–	Minworth Metals	5/6		30	30S	5 9 0	6/3	4/6¾	5/2¼	3/10½
5,187,938	Stk. (£1)	Morgan Crucible A	58/–	+2/3	14	13	4 16 6	71/3	53/4½	63/–	47/6
1,000,000	Stk. (£1)	Ditto 5½% Cum. 1st Pref. ...	14/–		5½	5½	7 17 3	17/–	13/10½	18/9	15/9
3,850,000	Stk. (£1)	Murex	41/6	+6d.	13	22½J	6 5 3	52/–	39/9	45/–	35/3
585,000	5/–	Ratcliffs (Great Bridge) Ord. ...	16/3		10	10R	3 1 6	16/6	15/9	17/–	14/9
1,064,880	10/–	Sanderson Kayser	33/–	+1/–	17½	35‡	5 6 0	41/3	23/–	40/3	27/7½
3,400,500	Stk. (5/–)	Serck	15/3	+3d.	12½	17½GD	4 2 0	19/3	14/9	25/6	15/3
212,384	5/–	Stedall & Co.	7/9	+3d.	15	15	9 13 6	10/3	7/6	10/3	6/3
8,035,372	Stk. (£1)	Stone-Platt Industries	54/–	+1/–	16	15	5 18 6	67/–	50/–	64/4½	52/3
2,928,963	Stk. (£1)	Ditto 5½% Cum. Pref.	14/–		5½	5½	7 17 3	18/–	13/6	18/7½	15/3
35,344,881	Stk. (£1)	Tube Investments Ord.	62/–		14	20	4 10 0	85/6	62/–	140/3	63/10½
41,000,000	Stk. (£1)	Vickers	32/9	+3d.	10	10	6 2 3	38/3	28/–	39/7½	27/1½
750,000	Stk. (£1)	Ditto Pref. 5%	13/3	+3d.	5	5	7 11 0	15/–	12/6	17/6	13/3
6,863,807	Stk. (£1)	Ditto Pref. 5% tax free	18/9	+3d.	*5	*5	7 18 9A	21/1½	18/3	24/6	20/1½
4,594,418	1	Ward (Thos. W.) Ord.	72/6		13¾	25	3 15 6	84/6	64/6	94/–	63/–
7,109,424	Stk. (£1)	Westinghouse Brake	32/3	—6d.	11	10	6 16 3	46/3	32/3	60/6	37/6
323,773	2/–	Wolverhampton Die-Casting ...	8/6	—3d.	35	30	8 4 9	13/4½	8/3	13/10½	8/1½
591,000	5/–	Wolverhampton Metal	22/1½	+10½d.	32½	32½	7 7 6	30/–	21/3	39/9	23/9
156,930	2/6	Wright, Bindley & Gell	4/4½		15	20‡	8 11 6	4/9	3/7½	4/6	2/10½
124,140	1	Ditto Cum. Pref. 6%	13/1½		6	6	9 2 9	13/7½	13/–	15/–	13/6
150,000	1/–	Zinc Alloy Rust Proof	4/3	—3d.	40	30	9 8 3	5/6	4/3	5/4½	4/–

*Dividend paid free of Income Tax. †Incorporating Zinc Corpn. & Imperial Smelting. **Shares of no Par Value. ‡and 100% capitalized issue. ● The figures given relate to the issue quoted in the third column. A Calculated on £7 8 9 gross. D and 50% capitalized issue. C paid out of Capital Profits. E and 50% capitalized issue in 7% 2nd Pref. Shares. R and 33⅓% capitalized issue in 8% Maximum Ordinary 5/– Stock Units. ϕ and 6¼% from Capital Profits. B and 50% capitalized issue. G and 50% capitalized issue. F and special 5% tax free dividend and 50% capitalized issue. ¶and 3 for 7 capitalized issue. L and 33⅓% capitalized issue. M and 10% capitalized issue. J and 75% capitalized issue. Q also 1/– special tax free dividend and 50% capitalized issue. T Per £1 unit. K Forecast dividend. S and 50% capitalized issue. V incorporating Clifford Covering.
The Thomas Bolton Capital has been acquired by British Insulated Callender's Cables.

D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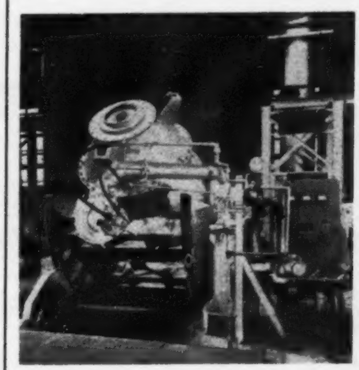

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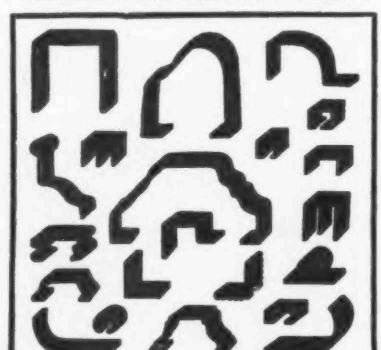
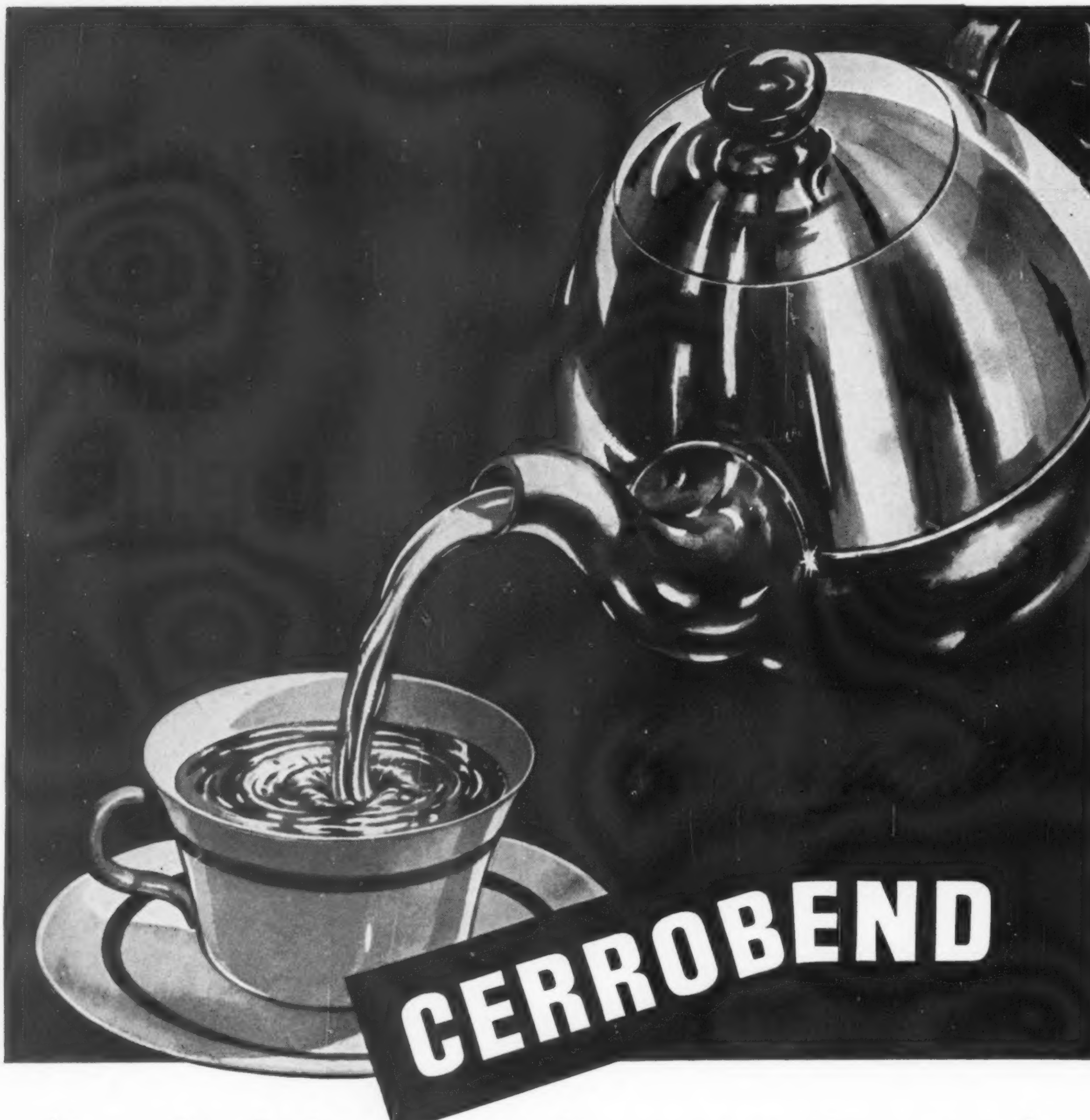


Printed in Great Britain by James Cond Ltd., Charlotte St., Birmingham 3. Published by Iliffe Production Publications Ltd., Dorset House, Stamford St., London, S.E.1



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